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The **cover illustrations** are of molluscs—Australian Museum specimens that are now 107 years old, they represent a small part of the scientific results of the trawling expedition of H.M.C.S. *Thetis* off the coast of New South Wales in February and March, 1898. The Australian Museum conchologist Charles Hedley worked on the material and published his findings in *Australian Museum Memoir* IV (1903). The faded impression of a cerambycid beetle provides background. The beetle—*Penthea adamsae* McKeown, 1938—was drawn by Australian Museum artist Nancy B. Adams, after whom this species was named in an earlier issue of *Records of the Australian Museum* 20(3).

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Phylogeny and Biogeography of the Eleotrid Genus *Hypseleotris* (Teleostei: Gobioidae: Eleotridae), With Redescription of *H. cyprinoides*

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ABSTRACT. *Hypseleotris* includes eight described and four undescribed species of small, laterally compressed gobioid fishes, unusual among them in that they superficially resemble cyprinids. One species is widespread throughout the fresh and brackish waters of the old world southern hemisphere; the remaining eleven species form a radiation in Australia and southern New Guinea. In this study, morphological and molecular characters are combined in a total evidence phylogenetic analysis in order to investigate the patterns of diversification in Australian and other *Hypseleotris*, including a consideration of biogeography. The species *H. dayi*, *H. tohizonae*, *H. leuciscus*, and *H. guentheri* are synonymized with *H. cyprinoides*. Within Australian *Hypseleotris*, *H. klunzingeri* is the most basal taxon, and the remainder of the species fall into two groups: a radiation in Western Australia and the Northern Territory, and a second radiation in the eastern, central, and southeastern river drainages.

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Hypseleotris Gill, 1863 (carp gudgeons) is a small genus of eleotrid fishes, consisting of approximately twelve species, although confusion surrounds the status of some taxa. The genus is diagnosed by several morphological characters, including a strongly laterally compressed head and body, a small mouth not reaching the anterior border of the orbit, an elongate body cavity with several anal pterygiophores preceding the first vertebral hemal spine, and an ovoid blotch at the dorsal base of the pectoral fin. *Hypseleotris* species have a broad range, occurring from South Africa to Japan, through southeast Asia to Australia. The majority of species

are freshwater, although widespread taxa have some salt-water tolerance (Allen *et al.*, 2002). The most widespread species is *H. cyprinoides* (Cuvier & Valenciennes, 1837), recorded from southeast Asia to Japan and west to the Reunion Islands. Additional related taxa occur in South Africa and Madagascar, (*H. dayi* Smith, 1950 and *H. tohizonae* Steindachner, 1880, respectively), although Hoesé (1986) has suggested these may be conspecific with *H. cyprinoides*. Four species were described from the Philippines (Herre, 1927: *H. agilis*, *H. bipartita*, *H. modestus* and *H. pangel*); these are also considered by some (D.

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Table 1. Summary of valid *Hypseleotris* species as indicated by this study.

taxon	status
<i>H. agilis</i> Herre, 1927	synonym of <i>Ophieleotris aporos</i>
<i>H. aurea</i> (Shipway, 1950)	valid
<i>H. bipartita</i> Herre, 1927	synonym of <i>H. cyprinoides</i>
<i>H. compressa</i> (Krefft, 1864)	valid
<i>H. compressocephalus</i> Chen & Zheng, 1985	not <i>Hypseleotris</i>
<i>H. cyprinoides</i> (Cuvier & Valenciennes, 1837)	valid
<i>H. dayi</i> Smith, 1950	synonym of <i>H. cyprinoides</i>
<i>H. ejuncida</i> Hoese & Allen, 1983	valid
<i>H. galii</i> (Ogilby, 1898)	valid
<i>H. guentheri</i> (Bleeker, 1875)	synonym of <i>H. cyprinoides</i>
<i>H. hainanensis</i> Chen & Zheng, 1985	valid as <i>Neodontobutis hainanensis</i>
<i>H. kimberleyensis</i> Hoese & Allen, 1983	valid
<i>H. klunzingeri</i> (Ogilby, 1898)	valid
<i>H. leuciscus</i> (Bleeker, 1853)	synonym of <i>H. cyprinoides</i>
<i>H. modestus</i> Herre, 1927	synonym of <i>H. cyprinoides</i>
<i>H. pangel</i> Herre, 1927	possible synonym of <i>H. cyprinoides</i>
<i>H. raji</i> Herre, 1945	synonym of <i>Butis koilomatodon</i>
<i>H. regalis</i> Hoese & Allen, 1983	valid
<i>H. tohizonae</i> Steindachner, 1880	synonym of <i>H. cyprinoides</i>
<i>H. sp. 3</i> Murray-Darling (Unmack, 2000)	valid
<i>H. sp. 4</i> Midgley's (Larson & Hoese, 1996)	valid
<i>H. sp. 5</i> Lake's (Larson & Hoese, 1996)	valid
<i>H. n.sp.</i> Katherine River	valid

Hoese, personal communication) to be possible synonyms of *H. cyprinoides*. An additional species, *H. leuciscus* (Bleeker, 1853) was described from Sumatra, Indonesia, and is also probably synonymous with *H. cyprinoides* (Kottelat, 1993). The widespread species *H. guentheri* (Bleeker, 1875) is known from Indonesia, the Caroline Islands, New Caledonia, New Ireland and northern New Guinea. The remaining seven described and four undescribed species are found within Australian freshwaters. A summary of *Hypseleotris* species names is given in Table 1.

Within Australia, *Hypseleotris compressa* (Krefft, 1864) is the most widespread form, occurring from eastern Victoria north and west to the Pilbara region of Western Australia, as well as southern New Guinea. It also apparently can tolerate some salinity (Merrick & Schmida, 1984); populations sampled across coastal Queensland and the Northern Territory showed low levels of sequence divergence, and little population structure (McGlashan & Hughes, 2001). The remaining species have undergone two radiations, one in the northwestern portion of the Australia, the other in the southeast. Within northwestern Australia most species have narrow ranges, often being known from only one river, or just a small portion of a drainage (Allen *et al.*, 2002). *Hypseleotris aurea* (Shipway, 1950) is known from the Gascoyne and Murchison rivers in the southern Pilbara. *Hypseleotris kimberleyensis* Hoese & Allen, 1983 has been recorded from Manning Gorge, a tributary of the Fitzroy River and the nearby Calder River. *Hypseleotris regalis* Hoese & Allen, 1983 is found in the Roe and Prince Regent rivers while *H. ejuncida* Hoese & Allen, 1983 only occurs in the latter (Allen, 1982). A recently discovered undescribed species occurs in the upper parts of the Katherine River (H.K. Larson, pers. comm.). In contrast, the two described and three undescribed *Hypseleotris* species in southeastern Australia are all relatively widespread. Of these, Midgley's carp gudgeon (*Hypseleotris*

sp. 4; name used here follows Larson & Hoese, [1996], equivalent to *H. sp. A* [Allen, 1989] and *H. sp. 1* [Allen *et al.*, 2002]) is the most widespread, occurring in coastal drainages from the Tully River in northeastern Queensland to the Brisbane River, and the inland drainages including the entire Murray-Darling Basin, Bulloo River and Cooper Creek. *Hypseleotris klunzingeri* (Ogilby, 1898) has an identical distribution to Midgley's carp gudgeon within inland drainages and is also found from around Rockhampton in central coastal Queensland south to the Clarence River in northern New South Wales. Lake's carp gudgeon (*Hypseleotris* sp. 5; name used here follows Larson & Hoese, [1996], equivalent to *H. sp. B* [Allen, 1989] and *H. sp. 2* [Allen *et al.*, 2002]) only occurs in inland drainages (Murray-Darling Basin, Bulloo River and Cooper Creek). The fourth species found within the Murray-Darling Basin is the recently recognized, but undescribed Murray-Darling carp gudgeon (*Hypseleotris* sp. 3; Unmack, 2000; Allen *et al.*, 2002). The last species, *H. galii* (Ogilby, 1898), is restricted to coastal drainages from near Bundaberg in southeastern Queensland south to the Georges River, Sydney, New South Wales.

Most *Hypseleotris* species are poorly known, both in terms of their biology and their distribution and abundance. The exceptions to this pattern are the *Hypseleotris* from southeastern Australia. Here, *Hypseleotris* species are ubiquitous and usually dominate the freshwater fish fauna in terms of abundance and richness, with three or four species commonly being found sympatrically (Unmack, 2000). Even in disturbed habitats, they are often the only native fish to be found. Despite their abundance, surprisingly little is known of their biology, largely due to difficulties in distinguishing the species. Some work has been conducted on the reproductive biology of *H. klunzingeri* (Lake, 1967), *H. compressa* (Auty, 1978), *H. galii* (Anderson *et al.*, 1971; Mackay, 1975; Konagai & Rimmer, 1985). The identification,

natural habitat and reproduction of all southeastern endemic *Hypseleotris* spp. were reviewed in Unmack (2000).

This study was undertaken in order to clarify the taxonomy of *Hypseleotris* species and construct a phylogeny for the genus. This phylogeny is then used to explore patterns of morphological character evolution, and to frame consideration of the biogeographic patterns among *Hypseleotris* species, in particular the pattern of freshwater radiations in Australia.

Materials and methods

Morphological methods

Hypseleotris species in the collection of the Australian Museum were examined for external morphology with a stereomicroscope. Specimens of *H. compressa* (AMS I.22039-001), *H. cyprinoides* (AMS I.21896-004), *H. guentheri* (AMS I.7453), *H. klunzingeri* (AMS I.22898-001), *H. galii* (AMS I.19016-002), *H. aurea* (AMS I.25492-002), *H. sp. 4* (Midgley's) (AMS I.22097-006) and *H. sp. 5* (Lake's) (AMS I.17619-008) were cleared and double stained for bone (alizarin red) and cartilage (alcian blue) by the method of Pothoff (1984) and dissected by a modification of the method for small teleosts outlined in Weitzman (1974). Additional cleared and stained specimens of *H. compressa*, *H. klunzingeri*, *H. galii*, *H. regalis*, *H. sp. 4* (Midgley's), and *H. sp. 5* (Lake's) in the AMS collections were examined. Radiographs of *H. regalis*, *H. ejuncida*, and *H. kimberleyensis* were also prepared (see list below).

In addition to external and skeletal morphology, the fifth ceratobranchial toothplates of several species were examined with the scanning electron microscope. For the species *Hypseleotris compressa* (AMS I.38538-005), *H. cyprinoides* (AMS I.21896-004, AMS I.25047-001), *H. guentheri* (AMS I.7908), *H. klunzingeri* (AMS I.22898-001), *H. galii* (AMS I.29669-001), *H. sp. 4* (Midgley's: AMS I.34817-001) and *H. sp. 5* (Lake's: AMS I.16002-020), both the right and left toothplates were removed, dehydrated in 95% ethanol, air dried and mounted on stubs, then sputter coated with gold and examined on the LEO 457 VP scanning electron microscope at the Australian Museum, Sydney, following the protocol of Parenti & Thomas (1998).

Frozen or ethanol-preserved samples of *Hypseleotris* species for DNA analysis were derived from several sources. Specimens of *H. klunzingeri*, *H. sp. 4* (Midgley's), *H. sp. 5* (Lake's) and *H. sp. 3* (Murray-Darling) were collected by Peter Unmack from various localities in Queensland, New South Wales and Victoria, as detailed in Figure 1. Individuals of a new species from the Katherine River, Northern Territory, Australia, were collected by Dion Wedd, Helen Larson & J. Bywater. Samples of *H. compressa* were collected by Aarn at Townsville, Queensland, Australia. *Hypseleotris dayi* Smith, 1950 was collected in Beachwood Pond, Durban, South Africa, by Mike Coke. *Hypseleotris cyprinoides* tissue was provided by Takahiko Mukai, from a fish collected by Toshiyuki Suzuki at Iriomote Island, Okinawa Prefecture, Japan. Samples of wild-collected captive *H. tohizonae* Steindachner, 1880 in the Denver Zoo were provided by Rick Haeffner and Paul Earle. The specimens of *H. dayi*, *H. sp. 3* (Murray-Darling), and *H. n.sp.* Katherine River were also examined for morphological characters and radiographs were prepared. All specimens

used for DNA sequencing are vouchered in the Natural History Museum of Los Angeles County tissue collection, identified by species name, and, if more than one individual, by extract code (see list below).

The holotype of *H. leuciscus* (RMNH 4669) was examined and radiographed. For determination of species validity, the holotype of *H. raji* Herre, 1945 (CAS 139863) was also examined. The holotypes of *H. compressocephalus* Chen & Zheng, 1985 and *H. hainanensis* Chen & Zheng, 1985 were not examined; Chen *et al.* (2002) assign *H. hainanensis* to a new genus, *Neodontobutis*, and it is clear from the figure in Pan *et al.* (1991) that *H. compressocephalus* is not a species of *Hypseleotris*. Holotypes of *H. agilis*, *H. bipartita* and *H. pangel* are lost, presumably destroyed in World War II. For *H. guentheri*, types were not designated in the original description (Bleeker, 1875), but a specimen was located in the Natural History Museum, London, that corresponds to the description exactly. Although not designated a type by Bleeker (1875), and not given a catalogue number until recently, the specimen was shelved in the type collection and there is little doubt that this specimen is the same one referred to by Bleeker (1875). This specimen (BMNH 2003.8.7.1) was recorded as originating from "Oualan" (Bleeker, 1875) or "Rivers of Bourbon, of Benculen (Sumatra), and of Oualan" (Günther, 1861). Examination of the specimen data confirms that the locality was misread by these authors; the actual locality is Ovalau Island, Fiji. Types were not examined for *H. cyprinoides*, *H. dayi*, and *H. tohizonae*; instead, I relied on observations taken by Helen Larson (pers. comm.) for the first two species, and the detailed original description for the third.

Molecular methods

Sequence of the ND2 gene from *Philypnodon grandiceps* and *Eleotris sandwicensis* was obtained from GenBank (AF391458 and AF391477-78); a previous study (Thacker, 2003) showed that these two genera are closely related to *Hypseleotris*; its proximal sister group remains unknown. The species *H. ejuncida*, *H. regalis*, *H. kimberleyensis*, *H. leuciscus* and *H. guentheri* were not sequenced; only morphological characters were coded for these species.

Muscle tissue from each specimen was used for total genomic DNA extraction, performed with the QIAamp Tissue Kit (QIAGEN Inc., Chatsworth CA). PCR was performed using primer pairs GOBY L4919 (5'-CCCATACCCCGAAAATGATG-3') to GOBY H5513 (5'-GAGTAGGCTAGGATTTTWCAGAGYTG-3') and GOBY L5464 (5'-GGTTGAGGRGGCCTMAACCARAC-3') or the *Hypseleotris*-specific modification HYPSL5464 (5'-GGRTGAGGCGGRCTAAACCARAC-3') to GOBY H6064 (5'-CTCCTACTTAGAGCTTTGAAGGC-3') using Platinum Taq DNA polymerase (Invitrogen Corp., Rockville, MD), with a profile 94° for 1 min 30s, followed by 40 cycles of 94°/15s denaturation, 45–50°/45s annealing and 70°/1 min extension. These primers amplify, in two fragments, the complete mitochondrial ND2 gene (1047 base pairs). PCR products were electrophoresed on a 1.5% low melting point agarose gel (NuSieve GTG, Cambrex Bioproducts, Rockville ME), and bands were excised and cleaned with the QiaQuick gel extraction kit (QIAGEN Inc., Chatsworth CA). Using the same primers (1 µM rather than

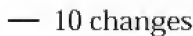


Fig. 1. Strict consensus of 189 most parsimonious hypotheses of *Hypseleotris* relationships. The numbers at nodes are decay index values, and changes of selected morphological characters are indicated with hash marks and the character number and state change (characters are represented with DELTRAN optimization). The species name and collection locality are indicated, and clades discussed in the text are lettered. In the southeastern species, abbreviations after the name and locality indicate the province or drainage basin: East Coast (EC, also known as Eastern Province), Murray-Darling Basin (MDB, Murray-Darling Province), or Lake Eyre Basin (LEB, Central Australian Province).

10 µM) the PCR fragments were cycle sequenced using the Big Dye terminator/Taq FS ready reaction kit and run on an ABI 377 automated sequencer (Perkin-Elmer, Foster City, CA). The heavy and light strands were sequenced separately. The resultant chromatograms for the heavy and light strands were reconciled using Sequencher (GeneCodes Corp., Ann Arbor, MI) to check basecalling, translated to amino acid sequence using the “mammalian mtDNA” code, concatenated for each taxon, and aligned by eye. Aligned nucleotide sequences were exported as NEXUS files from Sequencher, and imported into MacClade (Maddison & Maddison, 2000), where morphological data were added, using the “extended standard” character state option. Phylogenetic analyses were performed using PAUP*, version 4.0b8 (Swofford, 2001). One thousand replications of a heuristic search were performed, with *Eleotris sandwicensis* and *Philypnodon grandiceps* designated as the outgroup taxa. Decay indices (Bremer, 1988) were calculated with PAUP* and TreeRot v.2 (Sorenson, 1999).

Specimens examined

Identification of species follows the conclusions of this study: *Hypseleotris cyprinoides* includes *H. dayi*, *H. tohizonae*, *H. guentheri*, and *H. leuciscus*. *Hypseleotris* taxa are listed first, followed by outgroup taxa. Institutional abbreviations are as follows: AMS (Australian Museum, Sydney); BMNH (Natural History Museum, London); LACM (Natural History Museum of Los Angeles County); RMNH (Rijksmuseum van Natural Historie, Leiden).

Hypseleotris aurea AMS I.22743-001 (4), AMS I.25492-002 (43+3C&S), AMS I.25493-003 (1), Murchison River, Western Australia, Australia; AMS I.26406-003 (4), Wittenoom Gorge, Western Australia, Australia.

Hypseleotris compressa AMS I.15903-009 C&S no 367, Clarence River, New South Wales, Australia; AMS I.22039-001 (44+3C&S), Cairns, Queensland, Australia; AMS I.22088-003 C&S no 36 Burdekin River, Queensland, Australia; AMS I.22699-004 C&S no 354, Daintree River, Queensland, Australia; AMS I.22710-004 C&S no 352, Cape Tribulation, Queensland, Australia; AMS I.29681-001 (13) Nhulunbuy, Northern Territory, Australia; AMS I.35747-008 (86), Creek east of Grafton, New South Wales, Australia; AMS I.38538-005 (41), Ninds Creek, Queensland, Australia; AMS I.38557-002 (24), Scrubby Creek, Queensland, Australia; AMS I.38593-005 (9), Kandanga Creek, Queensland, Australia; AMS I.40090-006 (22), AMS I.40090-007 (64), Burdekin River, Queensland, Australia; AMS I.40328-005 (39), Mortons Creek and Hastings River, New South Wales, Australia.

Hypseleotris cyprinoides AMS IB.496 (1), Fiji; AMS IB.2246 (1), Hienghene River, New Caledonia; AMS I.7244 (1), Samoa; AMS I.7453(2), AMS I.7454 (2 C&S), Tavua, Fiji; AMS I.7906 (1), AMS I.7907 (1), AMS I.7908 (1), AMS I.7909 (1), AMS I.7910 (1), AMS I.7911 (1), AMS I.7912 (1), AMS I.7913 (1), Apia, Samoa; AMS I.19656-005 (2), Babelthuap Island, Palau, Caroline Islands; AMS I.21896-004 (4+3C&S), Tobuan Creek, Lingayan Bay, Philippines; AMS I.21924-002 (3), Batangas Province, Philippines; AMS I.25047-001 (4), Lagonoy River, Philippines; BMNH 1926.3.6.96-102 (12), Apia, Samoa; BMNH 1965.3.9.5 (1), Inawi, St. Joseph River, New Guinea; BMNH 2003.8.7.1 (1), Ovalau, Fiji (holotype of *H.*

guentheri); LACM 51857.003 (94), LACM 51858.010 (17), Guadalcanal, Solomon Islands; RMNH 4669 (1), West Sumatra (holotype of *H. leuciscus*).

Hypseleotris ejuncida AMS I.22745-001 (4) x-rayed, Gundarara Creek, 2 km above junction with Prince Regent River, Prince Regent Reserve, West Kimberley, Western Australia, Australia.

Hypseleotris galii AMS I.19016-002 (17+3 C&S), Poperaperin Creek, New South Wales, Australia; AMS I.19899-001 (7), Lane Cove River, New South Wales, Australia; AMS I.27273-001 C&S no 391, Saleyard Creek, New South Wales, Australia; AMS I.29669-001 (96), Creek between Cooluna and Noosa, Queensland, Australia; AMS I.35608-003 (42), Coffs Harbour, New South Wales, Australia; AMS I.38590-002 (8), Gillens Creek, Queensland, Australia; AMS I.40331-007 (8), Dungay Creek, New South Wales, Australia; AMS I.40350-004 (7), Clarence River, New South Wales, Australia.

Hypseleotris kimberleyensis AMS I.22742-001 (3) x-rayed, AMS I.25529-007 (2) x-rayed, Barnett River near Barnett Gorge, Central Kimberley, Western Australia.

Hypseleotris klunzingeri AMS IB.872 (8), Murray River, New South Wales, Australia; AMS I.13458 (12), Narrandera, North Yanco, New South Wales, Australia; AMS I.14963 (23), Colombo Creek, New South Wales, Australia; AMS I.17616-001 C&S no 345, Yanga Creek, Murrumbidgee River System, New South Wales, Australia; AMS I.17618-003 (133), Lake Bonney, South Australia, Australia; AMS I.22898-001 (86+3C&S), Mary River, Tinana Creek, Queensland, Australia; AMS I.29930-001 (34), Namoi River, New South Wales, Australia; AMS I.35588-006 (5), Meehi River, New South Wales, Australia; AMS I.38592-008 (106), Yabba Creek, Queensland, Australia; AMS I.39059-006 (27), Tuppal Creek, New South Wales, Australia; AMS I.40066-004 (19), Warrego River, Queensland, Australia.

Hypseleotris regalis AMS I.22744-001 (4) x-rayed, AMS I.22744-002 C&S no 368 Wyulda Creek, 2 km above junction with Roe River, Prince Regent Reserve, West Kimberley, Western Australia, Australia.

Hypseleotris sp. 4 (Midgley's) AMS I.18072-001 (4), north of Bonshaw, Queensland, Australia; AMS I.18965-009 C&S no 369, Namoi drainage, Wanourie Creek, New South Wales, Australia; AMS I.21284-005 C&S no 361, Montrose Creek, Queensland, Australia; AMS I.22097-006 (25+3C&S), Granite Creek, Queensland, Australia; AMS I.27257-002 C&S no 357, Barwon River and Namoi River Junction, New South Wales, Australia; AMS I.29929-001 (9), Northern River, New South Wales, Australia; AMS I.34802-001 (11), Bremer River, South Australia, Australia; AMS I.34816-001 (26), Angas River, Lake Alexandrina, South Australia, Australia; AMS I.34817-001 (24), Dawson Creek, Angas River, South Australia, Australia; AMS I.40163-001 (56), Creek off Peel River, New South Wales, Australia; AMS I.40164-006 (16), Darling River, New South Wales, Australia; AMS I.40489-001 (7), Macquarie Marshes, Macquarie River, New South Wales, Australia.

Hypseleotris sp. 5 (Lake's) AMS I.16002-020 (12), Darling River, New South Wales, Australia; AMS I.17619-008 (4+3C&S), Lake Bonney, South Australia, Australia; AMS I.27257-003 C&S no 358, AMS I.27257-004 C&S no 359, Barwon River and Namoi River Junction, New South Wales, Australia; AMS I.37820-010 (10), AMS

Table 2. Matrix of morphological character states used in this study. Character descriptions are given in the text.

taxon	character																			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
<i>H. agilis</i>	1	1	1	1	0	1	1	1	1	0	0	1	1	0	1	0	0&1	0	0	0
<i>H. aurea</i>	1	0	0	1	1	0	1	1	1	0	1	0	1	0	1	1	1	1	1	0
<i>H. compressa</i>	1	1	1	1	1	1	1	1	1	0	0	0&1	1	0	1	2	1	1	1	0
<i>H. cyprinoides</i>	1	1	1	1	0	1	1	1	1	0	0	0	1	0	1	2	1	1	0	0
<i>H. dayi</i>	?	?	1	1	0	1	1	1	1	0	0	1	1	0	1	2	1	1	0	0
<i>H. ejuncida</i>	0	1	0	1	1	0	1	1	1	0	1	1	1	0	1	1	1	1	1	1
<i>H. galii</i>	1	1	0	1	1	1	1	1	1	0&1	1	0&1	2	1	1	2	0	0	0	0
<i>H. guentheri</i>	1	1	1	1	0	1	1	1	1	0	0	1	1	0	1	2	1	1	0	0
<i>H. kimberleyensis</i>	0	1	0	1	1	2	1	1	1	0	1	1	1	0	1	1	1	1	1	1
<i>H. klunzingeri</i>	1	1	0	1	1	1	1	1	1	0&1	1	0&1	2	0&1	1	2	0	1	0	0
<i>H. leuciscus</i>	?	1	1	1	0	1	1	1	1	0	0	1	1	0	1	2	1	1	0	0
<i>H. regalis</i>	0	1	0	1	1	0	1	1	1	0	1	1	1	0	1	1	1	1	1	1
<i>H. tohizonae</i>	?	1	?	1	0	1	1	1	1	0	0	1	1	0	?	?	?	1	0	0
<i>H. sp. 3 Murray-Darling</i>	1	1	0	1	1	0	1	1	1	0&1	1	0&1	2	0&1	1	2	0	0	0	0
<i>H. sp. 4 Midgley's</i>	1	1	0	1	1	0	1	1	1	0&1	1	0&1	2	1	1	2	0	0	0	0
<i>H. sp. 5 Lakes</i>	1	1	0	1	1	2	1	1	1	1	1	0&1	2	1	1	2	0	0	1	0
<i>H. n.sp. Katherine River</i>	0	1	0	1	1	0	1	1	1	0	1	1	1	0	1	1	1	1	1	0
<i>Philypnodon grandiceps</i>	0	0	0	0	1	0&2	0	0	0	0&1	0&1	1	0	0	0	0	0	0	1	0
<i>Eleotris sandwicensis</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

I.37820-012 (3), AMS I.39060-002 (74), Tuppal Creek, New South Wales, Australia; AMS I.40339-001 (60), Dawson River, Queensland, Australia.

Eleotris sandwicensis LACM 56053-1 (1), LACM 56053-2 (1), North Oahu, Hawaii.

Philypnodon grandiceps AMS I.31622-001 (5), Nymboida River, New South Wales, Australia; AMS I.34350-004 (9), Werribee Creek, Queensland, Australia; AMS I.39060-006 (12), Tuppal Creek, New South Wales, Australia; LACM 4261-3 (16), MacDonald River, New South Wales, Australia. Radiographs only of SU 5797 (3) and USNM 48820 (4) were also examined.

In addition to these preserved specimens, frozen specimens of *H. dayi*, *H. sp. 3* (Murray-Darling) and *H. n.sp. Katherine River* were examined and radiographed. Individuals used for DNA sequencing are uncatalogued in the tissue collection of the Natural History Museum of Los Angeles County. Specimens used are identified by species name and extract number: *H. aurea* HAURI, HAURII, HAURIII; *H. compressa* HCOMI, HCOMII, HCOMIII; *H. cyprinoides* HCYP; *H. dayi* HDAY; *H. tohizonae* HTOHI, HTOHII; *H. galii* HGALI, HGALII, HGALIII; *H. klunzingeri* HKLUI, HKLUII, HKLUIII, HKLUIV, HKLUV; *H. n.sp. Katherine River* HKATI, HKATII; *H. sp. 3* (Murray-Darling) HMDI, HMDII; *H. sp. 4* (Midgley's) HMIDI, HMIDII, HMIDIII, HMIDIV, HMIDV; *H. sp. 5* (Lake's) HLAKEI, HLAKEII, HLAKEIII, HLAKEIV, HLAKEV, HLAKEVI.

Results

The morphological characters are numbered in accordance with the character matrix, shown in Table 2. Examination of internal anatomy from cleared and stained specimens or radiographs did not reveal any characters useful for resolving relationships among most of the species. Although slight variations were present in the robustness of bones, squamation and dentition, no significant differences were observed. Examination of fifth ceratobranchial toothplates

did not yield any characters useful for resolving phylogenetic relationships. The toothplates feature smooth, sharp teeth, evenly distributed across the toothplate except for a slightly denser region at the anterolateral edge. Tooth size was also generally uniform, with the exception of enlarged teeth on each toothplate along the posteriomedial borders.

- 1 Sexual dimorphism, with pronounced enlargement of the dorsal head/nape region in males. 0: no dimorphism in head/nape shape; 1: dimorphism present, males with enlarged heads/napes. The enlarged head/nape in males (state one) is seen in *H. cyprinoides*, *H. guentheri*, *H. compressa*, *H. aurea*, *H. galii*, *H. klunzingeri*, *H. sp. 3* (Murray-Darling), *H. sp. 4* (Midgley's) and *H. sp. 5* (Lake's). The males of *H. ejuncida*, *H. kimberleyensis*, *H. regalis*, *H. n.sp. Katherine River* and outgroups exhibit state zero. The condition of this character is unknown in *H. dayi*, *H. tohizonae* and *H. leuciscus*. In some species (*H. aurea*, *H. cyprinoides* and *H. guentheri*) the enlargement is less prominent than others.
- 2 Sexual dimorphism, elongated posterior rays in dorsal and anal fin, particularly during the breeding season. 0: no dimorphism; 1: dimorphism present, males with elongated dorsal- and anal-fin rays, extending to the caudal peduncle. The elongated fins in males (state one) are seen in *H. leuciscus*, *H. cyprinoides*, *H. tohizonae*, *H. guentheri*, *H. compressa*, *H. galii*, *H. klunzingeri*, *H. sp. 4* (Midgley's), *H. sp. 5* (Lake's), *H. sp. 3* (Murray-Darling), *H. ejuncida*, *H. kimberleyensis*, *H. regalis* and *H. n.sp. Katherine River*. The fins are not elongate in males (state zero) in outgroups and *H. aurea*; the condition of this character is unknown in *H. dayi*. The possibility remains that the absence of elongate fins in some species is an artifact due to collection outside the breeding season. Collections that are more seasonally complete will be necessary to address this.

- 3 Sensory canal pores. 0: preopercular (3–4) and suborbital (2) canal pores absent; 1: pores present. Sensory canal pores are absent (state zero) in outgroups, *H. aurea*, *H. ejuncida*, *H. kimberleyensis*, *H. regalis*, *H. n.sp.* Katherine River, *H. galii*, *H. klunzingeri*, *H. sp. 3* (Murray-Darling), *H. sp. 4* (Midgley's) and *H. sp. 5* (Lake's). Pores are present (state one) in *H. compressa*, *H. cyprinoides*, *H. dayi*, *H. guentheri*, and *H. leuciscus*. The condition of this character is not known for *H. tohizonae*. Polarity of this character is given based on assigning state zero to the outgroups used; the more general condition among eleotrids is for these pores to be present.
- 4 Pigment blotch on dorsal portion of pectoral-fin base. 0: blotch absent; 1: blotch present. A distinct, dark, oblong blotch on the pectoral-fin base is present (state one) in all species of *Hypseleotris*, and absent (state zero) in outgroups. There is some spotting and mottling on the pectoral-fin bases of *Eleotris sandwicensis*, but not a distinct single blotch as in *Hypseleotris*.
- 5 Interorbital scales. 0: interorbital scales present; 1: interorbital scales absent. Interorbital scales are present (state zero) in *Eleotris sandwicensis*, *Hypseleotris cyprinoides*, *H. dayi*, *H. tohizonae*, *H. leuciscus* and *H. guentheri*. The scales are absent (state one) in *Philypnodon grandiceps* and all other species of *Hypseleotris*.
- 6 Squamation on nape. 0: nape scaled, scales cycloid, small, embedded; 1: nape scaled, scales large, overlapping, cycloid or ctenoid; 2: no scales on nape. The nape is scaled with small, embedded cycloid scales (state zero), in *H. aurea*, *H. ejuncida*, *H. regalis*, *H. n.sp.* Katherine River, *H. sp. 3* (Murray-Darling) and *H. sp. 4* (Midgley's). The nape is scaled with large, overlapping cycloid or ctenoid scales (state one) in *H. cyprinoides*, *H. dayi*, *H. tohizonae*, *H. leuciscus*, *H. compressa*, *H. guentheri*, *H. galii* and *H. klunzingeri*. The nape is unscaled (state two) in *H. sp. 5* (Lake's) and *H. kimberleyensis*. Outgroup taxon *Eleotris sandwicensis* exhibits state zero, and *Philypnodon grandiceps* is polymorphic for states zero and two.
- 7 Laterally compressed, narrow head, much taller than wide. 0: head not compressed; 1: head compressed. The head is compressed (state one) in all species of *Hypseleotris*, and not compressed (state zero) in outgroups.
- 8 Pectoral-fin base size. 0: large, with dorsal most ray just behind or slightly below upper attachment of gill membrane; 1: small, with dorsal most ray well below upper attachment of gill membrane. The pectoral-fin base is small (state one) in all species of *Hypseleotris*, and large (state zero) in outgroups.
- 9 Mouth shape. 0: mouth not small, premaxilla extending posteriad past anterior edge of eye; 1: small terminal mouth, premaxilla not extending past anterior edge of eye. The mouth is small and terminal (state one) in all species of *Hypseleotris*, and large (state zero) in outgroups.
- 10 First dorsal-fin spines. 0: six spines; 1: seven or more spines. Six spines (state zero) is found in *H. compressa*, *H. cyprinoides*, *H. dayi*, *H. tohizonae*, *H. leuciscus*, *H. guentheri*, *H. aurea*, *H. ejuncida*, *H. kimberleyensis*, *H. regalis*, *H. n.sp.* Katherine River and *Eleotris sandwicensis*. Both states are seen in *Philypnodon grandiceps*, *H. galii*, *H. klunzingeri*, *H. sp. 3* (Murray-Darling) and *H. sp. 4* (Midgley's). *Hypseleotris sp. 5* (Lake's) always has more than six spines (state 1).
- 11 Second dorsal-fin elements. 0: eight or nine elements; 1: ten to fourteen elements. The second dorsal fin consists of one spine followed by seven or more soft segmented rays. The most posterior ray is split to its base but counted as a single element. *Hypseleotris compressa*, *H. cyprinoides*, *H. dayi*, *H. tohizonae*, *H. leuciscus*, *H. guentheri* and *Eleotris sandwicensis* have eight or nine elements (state zero); the species *H. aurea*, *H. galii*, *H. klunzingeri*, *H. sp. 3* (Murray-Darling), *H. sp. 4* (Midgley's), *H. sp. 5* (Lake's), *H. ejuncida*, *H. kimberleyensis*, *H. regalis* and *H. n.sp.* Katherine River have second dorsal fins with ten to fourteen elements (state one). The outgroup taxon *Philypnodon grandiceps* is polymorphic, exhibiting state zero or one. The distinction between states given here was used because in no *Hypseleotris* species does the dorsal-fin ray range span that breakpoint (no *Hypseleotris* species is polymorphic for this character).
- 12 Interneural gap in dorsal fin. 0: interneural gap absent; 1: interneural gap present. An interneural gap, which is an interneural space between the first and second dorsal fins that does not have a pterygiophore associated with it, is absent (state zero) in *H. aurea*, *H. cyprinoides* and *Eleotris sandwicensis*. The gap is present (state one) in *Philypnodon grandiceps*, *H. dayi*, *H. tohizonae*, *H. leuciscus*, *H. guentheri*, *H. regalis*, *H. kimberleyensis*, *H. ejuncida* and *H. n.sp.* Katherine River. The interneural gap is seen uncommonly (coded as state 0&1) in *H. compressa*, *H. galii*, *H. klunzingeri*, *H. sp. 3* (Murray-Darling), *H. sp. 4* (Midgley's) and *H. sp. 5* (Lake's), species in which the dorsal pterygiophore patterns are variable.
- 13 Second dorsal-fin pigment in males. 0: Second dorsal fin clear to dusky, or with black bands on pale ground, not brightly coloured; 1: Basal third to half of second dorsal fin with light spots on black ground, then with distal stripes; 2: Second dorsal fin unspotted and with three to five coloured lateral bands, generally (from body dorsad) pale, dark, orange, white. The second dorsal is without a spotted or striped pattern in *Eleotris sandwicensis*, and with a darkly striped pattern unlike that seen in *Hypseleotris* in *Philypnodon grandiceps*; both are coded as state zero. The second dorsal is spotted (state one) in *H. compressa*, *H. cyprinoides*, *H. dayi*, *H. tohizonae*, *H. leuciscus*, *H. guentheri*, *H. aurea*, *H. regalis*, *H. kimberleyensis*, *H. ejuncida* and *H. n.sp.* Katherine River. The second dorsal is striped (state two) in *H. galii*, *H. klunzingeri*, *H. sp. 3* (Murray-Darling), *H. sp. 4* (Midgley's) and *H. sp. 5* (Lake's). This character was coded in part from descriptions and

photos of live colouration in Hoesé & Allen (1983); Allen (1991); and Unmack (2000); this colouration is most intense during the breeding season.

- 14 Anal-fin element number. 0: nine to twelve elements; 1: thirteen, fourteen or fifteen elements. The anal fin consists of a single spine, followed by nine to fourteen soft rays. Nine to twelve anal elements (state zero) are found in outgroups, *H. cyprinoides*, *H. dayi*, *H. tohizonae*, *H. leuciscus*, *H. compressa*, *H. guentheri*, *H. aurea*, *H. regalis*, *H. ejuncida*, *H. kimberleyensis* and *H. n.sp.* Katherine River. Thirteen to fifteen elements (state 1) are found in *H. galii*, *H. sp. 4* (Midgley's) and *H. sp. 5* (Lake's). *Hypseleotris klunzingeri* and *H. sp. 3* (Murray-Darling) exhibit both states. The breakpoint between states for this character was chosen to minimize the number of *Hypseleotris* species coded as polymorphic.
- 15 Anal-fin elements preceding first hemal spine (elongate body cavity). 0: 0–5 anal-fin elements preceding first hemal spine; 1: 6–11 anal-fin elements preceding the first hemal spine. Six or more anal-fin elements precede the first hemal spine (state 1) in all species of *Hypseleotris* examined; the character state is unknown for *H. tohizonae*. In *Hypseleotris* species, this character is correlated with a body cavity that is very elongate posteriad. Outgroups have five or fewer anal elements preceding the first hemal spine (state zero). The breakpoint between states (counts of anal-fin elements preceding first hemal spine) was determined by coupling count information with the observation that *Hypseleotris* species also have the elongate body cavity.
- 16 Precaudal vertebrae. 0: fewer than 13; 1: 13; 2: more than 13. The condition of fewer than 13 precaudal vertebrae (state zero) is found in the outgroups. Thirteen precaudal vertebrae (state one) are present in *H. aurea*, *H. ejuncida*, *H. kimberleyensis*, *H. regalis* and *H. n.sp.* Katherine River. More than thirteen precaudal vertebrae (state 2) are present in *H. cyprinoides*, *H. dayi*, *H. leuciscus*, *H. compressa*, *H. guentheri*, *H. galii*, *H. klunzingeri*, *H. sp. 3* (Murray-Darling), *H. sp. 4* (Midgley's) and *H. sp. 5* (Lake's). The condition for this character is unknown for *H. tohizonae*.
- 17 Caudal vertebrae. 0: 13–19; 1: 9–12. Thirteen to nineteen caudal vertebrae (state zero) is observed in *H. galii*, *H. klunzingeri*, *H. sp. 3* (Murray-Darling), *H. sp. 4* (Midgley's), *H. sp. 5* (Lake's) and outgroups. Nine to twelve caudal vertebrae (state 1) is seen in *H. cyprinoides*, *H. dayi*, *H. leuciscus*, *H. compressa*, *H. guentheri*, *H. aurea*, *H. ejuncida*, *H. kimberleyensis*, *H. regalis* and *H. n.sp.* Katherine River. The condition of this character is unknown for *H. tohizonae*.
- 18 Caudal-fin pigment pattern: dark blotch in ventral half of fin, just posteriad of caudal peduncle. 0: caudal blotch absent; 1: caudal blotch present. A blotch on the ventral half of the caudal fin (state one) is seen in *H. cyprinoides*, *H. dayi*, *H. tohizonae*, *H. leuciscus*, *H. guentheri*, *H. compressa*, *H. aurea*, *H. ejuncida*, *H. kimberleyensis*, *H. regalis* and *H. klunzingeri*. *Hypseleotris galii*, *H. sp. 3* (Murray-Darling), *H. sp. 4* (Midgley's), *H. sp. 5* (Lake's), and outgroups lack the caudal blotch (state zero).
- 19 Scales on cheek. 0: scales present on cheek; 1: cheek not scaled, or with few tiny embedded cycloid scales. The cheek is scaled (state zero) in *Eleotris sandwicensis*, *H. cyprinoides*, *H. dayi*, *H. galii*, *H. guentheri*, *H. klunzingeri*, *H. leuciscus*, *H. tohizonae*, *H. sp. 3* (Murray-Darling), and *H. sp. 4* (Midgley's). The cheek is naked or with very few scales (state 1) in *Philypnodon grandiceps*, *H. sp. 5* (Lake's), *H. aurea*, *H. compressa*, *H. regalis*, *H. ejuncida*, *H. kimberleyensis* and *H. n.sp.* Katherine River.
- 20 Slender body. 0: body not slender, depth at anal-fin origin more than 20% of standard length in males; 1: body slender, depth at anal-fin origin less than 20% of standard length in both males and females. A slender body (state 1) in both sexes is found in *H. regalis*, *H. ejuncida* and *H. kimberleyensis*. Other *Hypseleotris* species and outgroups share state zero. Some data for this character were taken from Hoesé & Allen (1983).

Some autapomorphic characters were identified that are useful for species identification, but not informative for phylogenetic analysis. The species *H. klunzingeri* may be distinguished by the presence of transverse rows of papillae on the face; females of *H. galii* possess a black urogenital papilla; and *H. aurea* has notably small scales (34–43 in lateral series).

Of the 1047 base pairs of the ND2 gene, 428 were parsimony-informative (sequences available in GenBank under accession numbers AF514365–AF514396). All morphological characters were informative, for a total of 448 informative characters in the combined data set. Parsimony analysis of the combined molecular and morphological data set resulted in 189 most parsimonious hypotheses, with length 1488, consistency index 0.586, retention index 0.803 and rescaled consistency index of 0.471; a strict consensus of these hypotheses is shown in Figure 1. If the data are analysed without the five species for which molecular data are lacking (*Hypseleotris ejuncida*, *H. regalis*, *H. kimberleyensis*, *H. leuciscus* and *H. guentheri*), the single most parsimonious topology that results is the same as for the combined analysis, but with those taxa pruned out, with one slight difference. In the DNA only tree, there is structure in the clade containing *H. cyprinoides*, of the form: (*H. cyprinoides* [*H. tohizonae* I (*H. dayi*, *H. tohizonae* II)]). In the strict consensus of trees from the combined analysis, these taxa form a polytomy.

Discussion

Basal *Hypseleotris*

The phylogenetic hypothesis presented in Figure 1 supports (with a decay index of eleven) a monophyletic *Hypseleotris* (clade A). The genus is diagnosed by two sexually dimorphic characters, the presence of enlarged heads in males (reversed in *H. ejuncida*, *H. kimberleyensis*, *H. regalis* and *H. n.sp.* Katherine River), and the presence of elongated dorsal and anal fins in males (reversed in *H. aurea*); the presence of a distinct pigment blotch on the pectoral-fin base; a constricted pectoral-fin base; a posteriorly elongate body cavity, with 6–11 anal pterygiophores preceding the first hemal spine; a precaudal vertebral count of 13 or greater; a strongly laterally compressed head and body; a small, terminal mouth whose posterior border does not reach the anterior border of the eye; a blotch of pigment on the ventral half of the caudal peduncle (reversed in *H. galii*, *H. sp. 3* [Murray-Darling], *H. sp. 4* [Midgley's], and *H. sp. 5* [Lake's]) and, a change in second dorsal-fin pigment to a pattern of distal stripes and proximally pale dots on black ground. The most basal clade contains the nominal taxa *H. cyprinoides*, *H. dayi*, *H. tohizonae*, *H. leuciscus* and *H. guentheri*. The remaining clade contains all the Australian species.

Several conclusions regarding the identity of species and the allocation of names are supported by the phylogenetic hypothesis. In addition to the well-known taxa, other names have been used for *Hypseleotris* species that are not *Hypseleotris*. Two species from China, *H. compressocephalus* (Chen, 1985) and *H. hainanensis* Chen, 1985, lack the diagnostic features of the genus; both lack the pectoral-fin pigment blotch, the small, terminal mouth and the striped/spotted second dorsal-fin pattern. Additionally, *H. compressocephalus* has dorsal fin element counts of IX+I,13, higher than any *Hypseleotris* except *H. sp. 5* (Lake's) (Pan *et al.*, 1991). Chen *et al.* (2002) confirm that *H. hainanensis* is not *Hypseleotris*, describing for it a new genus, *Neodontobutis*. The species described as *H. raji* Herre, 1945 is also not *Hypseleotris*; it also lacks the pectoral-fin pigment blotch, the small, terminal mouth and the striped/spotted second dorsal-fin pattern, and the series of anal-fin pterygiophores preceding the first hemal spine. The locality for the *H. raji* holotype (CAS 139863) is listed as the Adyar River, Madras, S. India, in the records of the California Academy of Sciences. However, in the description the locality is listed as a brook near Un Long, New Territory, Hong Kong. Doug Hoese (pers. comm.) regards *H. raji* as a synonym of *Butis koilomatodon* (Bleeker, 1849).

Two issues surrounding the non-Australian species were considered: the number and identity of species found in the Philippines, and the validity of several taxa (*H. dayi*, *H. tohizonae*, *H. leuciscus* and *H. guentheri*) relative to *H. cyprinoides*. Herre (1927) lists five Philippine species of *Hypseleotris*: *H. cyprinoides*, *H. modestus*, *H. agilis*, *H. bipartita* and *H. pangel*. Herre (1927) doubted the presence of *H. cyprinoides* in the Philippines, but it has since been confirmed to exist there. Herre (1927) distinguishes *H. modestus* from *H. cyprinoides* only in sometimes having one more soft dorsal ray and one to two more anal rays. Kottelat *et al.* (1993) indicated that *H. modestus* is a

synonym of *H. leuciscus*, itself possibly a synonym of *H. cyprinoides*. Examination of the type of *H. leuciscus* in this study (RMNH 4669) shows that *H. leuciscus* (and thus *H. modestus*) is synonymous with *H. cyprinoides*, as discussed below and shown in Table 1.

The other three species considered by Herre (1927: *H. agilis*, *H. bipartita* and *H. pangel*) are known only from the Philippines. Types of these species are not extant, and are presumed to have been destroyed in World War II (Eschmeyer, 1998). Based on Herre (1927), who distinguishes them by slight differences in body proportions and by their colour patterns, all three species have meristic values consistent with *H. cyprinoides*. *Hypseleotris agilis* is the most distinctive, featuring a pattern of eight spots mediolaterally and three stripes radiating posteriad from the eye, with a fourth crossing the opercle but not extending to the eye. Specimens of *Ophieleotris aporos* captured at Laguna de Bay, near Manila, fit the description of *H. agilis*, and therefore we regard *H. agilis* as a synonym of *O. aporos*.

The two remaining Philippine species of Herre (1927) are *H. bipartita* and *H. pangel*; the specimens Herre (1927) examined for these species fall into two size classes. Those classified as *H. bipartita* ranged from 22 to 37 mm in length and exhibited a spot or short bar on the ventral portion of the caudal-fin base, and a second dorsal in males with pale spots on a black background. The *H. pangel* specimens were 32 to 47 mm in length and featured the second dorsal, anal and caudal fins with blotches or bars, and in some specimens, a fine lateral black band. The description and illustration of *H. bipartita* coincides very well with that of *H. cyprinoides*, that of *H. pangel* less so, but the *H. pangel* specimens are larger and variations in colour pattern may develop with size. Given the similarity in colour pattern and absence of unique differences, we recommend synonymizing *H. bipartita* with *H. cyprinoides*. We reserve judgment on *H. pangel*; if the colouration differences reported by Herre (1927) are not ontogenetically variable, then it may be a valid species. We have no specimens of *H. pangel*, therefore, we do not consider it further.

The issue of species identities throughout the range of non-Australian *Hypseleotris* is largely a question of the boundaries and variability within *H. cyprinoides*. This widespread species of *Hypseleotris* can tolerate salt water (Bruton, 1996), and is known from South Africa, Madagascar, Reunion Island, east to New Guinea and north to the Philippines and Japan. The names *H. dayi* (South Africa), *H. tohizonae* (Madagascar), *H. leuciscus* (Indonesia and west Pacific) and *H. guentheri* (northern New Guinea and west Pacific) have all been used for fish that agree with the description of *H. cyprinoides*, with some minor variation in colour pattern. The phylogenetic analysis in this study included morphological data for *H. cyprinoides*, *H. dayi*, *H. tohizonae*, *H. leuciscus* and *H. guentheri*, coupled with DNA sequence for *H. cyprinoides*, *H. dayi* and *H. tohizonae*; these five taxa formed a polytomy in the total evidence analysis. Based on these results we advocate synonymization of *H. dayi*, *H. leuciscus*, *H. tohizonae* and *H. guentheri* under *H. cyprinoides*. This recommendation is in accord with similar remarks by Hoese (1986) for *H. dayi* and *H. tohizonae*, and Kottelat *et al.* (1993) for *H. leuciscus* (Table 1). *Hypseleotris cyprinoides* is formally rediagnosed below.

Redescription of *Hypseleotris cyprinoides*

Hypseleotris cyprinoides (Valenciennes in Cuvier & Valenciennes, 1837: 248).

Synonyms. *Hypseleotris bipartita* Herre, 1927; *H. dayi* Smith, 1950; *H. guentheri* (Bleeker, 1875); *H. leuciscus* (Bleeker, 1853); *H. tohizonae* (Steindachner, 1880); *Asterropteryx modestus* Bleeker, 1875.

Type material SYNTYPES: 2, MNHN A-1568; 1, MNHN 2099.

Type locality. Saint Maurice River, Reunion Island.

Material examined. See list under "Specimens examined" above.

Differential diagnosis. *Hypseleotris cyprinoides* is distinguished from all other *Hypseleotris* by the presence of scales extending anteriorly to the interorbital region.

Description

Dorsal VI+I, 8–9; anal I, 9–11; vertebrae 14+10; dorsal pterygiophore formula 3–1221 or 3–12210. 24–27 scales in longitudinal series. Body laterally compressed, depth 3.9 to 4.6 in length. Eye diameter 3.7 to 4.6 in head, interorbital 1.0 to 1.2 times eye diameter. Head depressed, with small terminal mouth just reaching anterior margin of orbit. Caudal fin rounded.

Body covered with large scales, those on head and predorsal and preventral regions cycloid, the remainder ctenoid, small ctenoid scales on base of caudal, scales on top of head extend forward to between nostrils, operculum scaled, cheek scaled to beneath orbit. Colour in alcohol brown, countershaded darker on dorsal half, melanophores concentrated on posterior scale margins, sometimes coalesced into a dark midlateral stripe that may extend anteriorly onto operculum and snout. Distinct dark blotch on dorsal half of pectoral-fin base and lower half of caudal-fin base. Median fins mottled except second dorsal fin in males; second dorsal fin in males with pale spots on dark ground on proximal third to half, alternating dark and pale stripes on distal two thirds to half. This species is amply illustrated; examples include Allen (1991), Bruton (1996), Hoese (1986), and Kottelat *et al.* (1993).

Remarks

Hypseleotris cyprinoides is redescribed in order to clarify the identity of this widespread species, and to include the various taxa here synonymized with it. The nominal species *H. bipartita*, *H. dayi*, *H. tohizonae*, *H. leuciscus*, *H. modestus*, and *H. guentheri* all agree in meristic values and overall proportions, and have been distinguished on the basis of colouration. The colouration is somewhat variable, but there is always an obvious black spot present on the ventral half of the caudal peduncle at the edge of the caudal fin (in addition to the *Hypseleotris*-diagnostic blotch at the upper base of the pectoral fin). The remainder of the body may be faintly speckled with black (as described in the original description of *Eleotris* [*Hypseleotris*] *cyprinoides* Cuvier & Valenciennes 1837 [excerpted in Herre, 1927], and in accounts of *H. dayi* [Hoese, 1986]), or without any dark

pigment. Descriptions of *H. tohizonae* (Steindachner, 1880), *H. leuciscus* (Kottelat *et al.*, 1993), and *H. guentheri* (Günther, 1861; Bleeker, 1875; Ogilby, 1898; Allen, 1991) differ only in that the fine black spots are concentrated on the posterior margins of the scales, and aggregated into a lateral black band that extends to and meets the black spot on the caudal peduncle. In smaller individuals (up to approximately 35 mm SL) the body is more slender, without the lateral stripe and with clear or faintly brown-spotted median fins. Larger individuals feature the lateral stripe, a stockier body and median fins with more pronounced colouration: two pale stripes on black ground in the first dorsal fin, and three to four rows of pale spots on black ground on the proximal portion of the second dorsal fin. This degree of variation is also found in the other widespread *Hypseleotris* species, *H. compressa*, which exhibits variation in colour patterns and morphology that slowly changes with age, and may change rapidly depending upon mood or reproductive state (Larson & Hoese, 1996).

Australian *Hypseleotris*: Phylogeny

The remaining *Hypseleotris* species are endemic to Australia (and New Guinea, in the case of *H. compressa*), and form a monophyletic group with a decay index of two (Fig. 1, clade B). This group is diagnosed by the absence of preopercular and suborbital sensory pores (reversed in *H. compressa*, which has the pores); absence of interorbital scales, and elongated second dorsal fins with ten to thirteen elements (also reversed in *H. compressa*, which has the primitive condition of nine elements). Within the Australian clade, *H. klunzingeri* is the most basal; this species is widespread within southeastern Australia.

The remainder of the Australian species are divided in the phylogenetic hypothesis into two clades: the north-western radiation (Fig. 1, clade C) is diagnosed by a reduction in caudal vertebrae (9–12 rather than 13–16; this state is also found in *Hypseleotris cyprinoides*). This clade contains the western Australian *H. aurea*, and a clade containing *H. compressa*, a coastal species with a wide distribution, ranging from Western Australia, around the northern and eastern shores of the continent, plus a radiation from the Kimberley region containing *H. ejuncida*, *H. kimberleyensis* and *H. regalis*, and *H. n.sp.* Katherine River (Northern Territory). Support for nodes, as seen in the decay indices, is low in this portion of the phylogeny, likely due to the lack of molecular data for the species *H. ejuncida*, *H. kimberleyensis*, and *H. regalis*. The Kimberley/Katherine River radiation is diagnosed by a reversal of the sexual dimorphism in head shape (these species lack the enlarged heads found in males of other *Hypseleotris* species) and by the presence of 13 precaudal vertebrae. *Hypseleotris aurea* also features 13 precaudal vertebrae, and a reversal of the other *Hypseleotris*-diagnostic sexual dimorphism character, the posterior elongation of the dorsal and anal fin-rays in males. The widespread salt-tolerant *H. compressa* is nested within the northwestern radiation, and is characterized by reversals of two characters, the presence of preopercular and suborbital head sensory canal pores, and a reduction of the number of elements in the second dorsal fin. This placement contradicts an earlier suggestion (Hoese & Allen, 1983) that *H. compressa* is the sister species to *H. cyprinoides*.

A second clade of Australian *Hypseleotris* (Fig. 1, clade D) occurs in southeastern Australia, and includes the species *H. galii*, and three undescribed species: *H. sp. 3* (Murray-Darling), *H. sp. 4* (Midgley's) and *H. sp. 5* (Lake's). Morphological patterns evident in this clade include a loss of the dark blotch in the ventral portion of the caudal fin, and increases in both the number of anal-fin elements and dorsal-fin spines; the insertion pattern of the dorsal spines also varies widely. These four species also share with *H. klunzingeri* a striped, brightly coloured pattern lacking spots in the second dorsal fin of males; other *Hypseleotris* species exhibit a pattern of pale spots in combination with striping.

Other phylogenetically informative characters may exist concerning the reproductive biology of *Hypseleotris*, but this character system was not included in the phylogeny, as the information was lacking for many species. Auty (1978) notes the eggs of *H. compressa* are more typical of marine pelagic eggs than freshwater demersal ones. The characteristics Auty (1978) lists include rapid development, thin chorion, poorly developed prolarvae, lacking a mouth and pigmented eye at hatching, high fecundity and presence of oil globules. Similar characteristics are also found in *H. klunzingeri* (Lake, 1967). We suspect these traits are ancestral within *Hypseleotris*. Another change in the reproductive biology occurred within clade D (Fig. 1); all these species have longer development times, well-developed larvae at hatching and lower fecundity (Anderson *et al.*, 1971; Unmack, 2000). Anderson *et al.* (1971) suggested this was an adaptation to the different environments inhabited by *H. klunzingeri* and *H. galii*, however, these species are sympatric in parts of their range, and the characteristics of *H. klunzingeri* appear to be ancestral.

A recent study of allozyme polymorphism among *Hypseleotris* from the lower Murray River [*H. klunzingeri*, *H. sp. 3* (Murray-Darling), *H. sp. 4* (Midgley's) and *H. sp. 5* (Lake's)] revealed a complex system of genetic interchange among species (Bertozzi *et al.*, 2000). These authors demonstrated the presence of three genetic types, HA, HB and HC, and found evidence of three hybrid classes designated HAxHB, HAxHX and HBxHX; HX is a type not sampled in pure form in their study. They provisionally identify HC as *H. klunzingeri*, the composite class HA, HB and HAxHB as representing the morphologically similar forms *H. sp. 3* (Murray-Darling) and *H. sp. 4* (Midgley's), and the HBxHX hybrid as *H. sp. 5* (Lake's). Our results support the contention that *H. sp. 5* (Lake's) hybridizes with sympatric *H. sp. 4* (Midgley's) from the Barcoo River; in the phylogeny, these *H. sp. 5* (Lake's) individuals are nested deep within the *H. sp. 4* (Midgley's) clade (Fig. 1). In this case, it is possible the *H. sp. 5* (Lake's) individuals clustered within *H. sp. 4* (Midgley's) are hybrids with *H. sp. 4* (Midgley's) mothers, or simply that a mitochondrial introgression has taken place between the two species. The molecular marker used in this study is mitochondrial, therefore, phylogenetic analysis of this gene reveals only the maternal lineage patterns. Two other possibilities exist that could explain the phylogenetic pattern observed among species of *H. sp. 4* (Midgley's) and *H. sp. 5* (Lake's); the species are not distinct, or the specimens used are improperly identified. These possibilities are difficult to evaluate because the species have not been formerly described, however, all specimens used in the molecular analysis were identified using the characters described in Larson & Hoese

(1996) and Allen (1989); these characters provide a morphological basis for distinguishing the two taxa. Additional molecular studies are underway, using both mitochondrial and nuclear markers, that will address questions of identity and distinction between *H. sp. 4* (Midgley's) and *H. sp. 5* (Lake's).

Australian *Hypseleotris*: Biogeography

Overall, a historical geographic pattern of southward expansion from Indo-Pacific Islands to Australia is indicated in the phylogeny of *Hypseleotris* species. Our phylogenetic hypothesis is consistent with an origin in Southeast Asia. An ancestor to *H. cyprinoides* may have dispersed via marine environments from South East Asia and became widespread, eventually reaching southeastern Australia where it invaded freshwaters. The Australian fish fauna is relatively depauperate and lacks the dominant ostariophysan groups found throughout most of the range of *Hypseleotris* (Allen, 1989). This situation may have provided an opportunity for *Hypseleotris* to radiate within Australia once it invaded freshwater. Unfortunately, no fossil evidence exists that could indicate when this invasion occurred.

The phylogeny indicates the presence of two radiations, one in northwestern Australia (Fig. 1, clade C), and a second within southeastern Australia (Fig. 1, clade D). It is unclear why radiations occurred in these different climatic regions, or why no *Hypseleotris* other than *H. compressa* occur in the geographic areas in between, nor in southern New Guinea where seemingly suitable habitats exist. One possible explanation is that invasion of the western coast was via central Australian drainages, thus invasion of the northern coastal drainages simply never occurred. The Central Australian Province (which contains the basal Australian species *H. klunzingeri*) shares a drainage divide with the Paleo-Victoria drainage (as well as many other drainages) that may have allowed aquatic fauna to move (Unmack, 2001) prior to the onset of aridity that has gradually increased since mid-Miocene (Van de Graaff *et al.*, 1977). From the Victoria River, movement to other drainages would have been relatively easy between adjacent rivers during lowered sea levels or over single drainage divides into rivers draining the Pilbara region (Unmack, 2001). Most *Hypseleotris* species within northwestern Australia are not widespread, suggesting suitable habitats are limited, or their migratory abilities are poor (which does not seem to be the case in other *Hypseleotris* species). The Kimberley and Pilbara regions have high proportions of endemic species, many of which have limited ranges (Unmack, 2001). It is possible these species are remnants persisting in small refugia within the numerous gorges in these regions that provide a more permanent water supply.

Southeastern Australia contains an assortment of *Hypseleotris* species with complex biogeographic relationships. The primary biogeographic barrier within this region is the Eastern Highlands, the mountain range that separates the Eastern Province from the Murray-Darling Province. A smaller mountain range separates the Murray-Darling Province from the Central Australian Province (including the Lake Eyre Basin). Three of the species are found in more than one of these provinces, and it is likely they have had opportunities to move at different times between provinces. A number of closely related fish species

pairs or conspecifics are known to occur between Eastern Province and Murray-Darling Province (c. 20 pairs or conspecifics total) and Murray-Darling Province and Central Australian Province (c. 13 pairs or conspecifics total), suggesting faunal exchange has been common (Unmack, 2001). Previously, Unmack (2000) suggested qualitative morphological differences existed between Eastern Province and Murray-Darling Province/Central Australian Province populations of *H. klunzingeri* and *H. sp. 4* (Midgley's). Our results are broadly compatible with that hypothesis, and further studies are underway examining the detailed intraspecific phylogenies of southeastern Australian freshwater fish species, based on both nuclear and mitochondrial markers.

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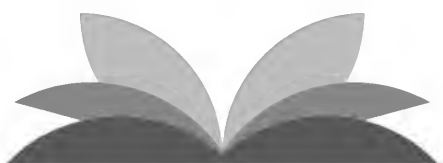
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The Genus *Trichadenotecnum* (Insecta: Psocoptera: Psocidae) in Sumatra, Indonesia, With Description of Thirteen New Species

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ABSTRACT. Records of 20 species of *Trichadenotecnum* Enderlein (Psocidae) from Sumatra, including 13 species described here as new, are provided. Keys are given to the 33 species of the genus now known from Indonesia, and their relationships and distribution discussed. Most species are known from few individuals and appear to be scarce. Several new species are referable to species groups designated by Yoshizawa for Japanese taxa, but others are anomalous.

ENDANG SRI KENTJONOWATI & T.R. NEW, 2005. The genus *Trichadenotecnum* (Insecta: Psocoptera: Psocidae) in Sumatra, Indonesia, with description of thirteen new species. *Records of the Australian Museum* 57(1): 15–38.

Endang *et al.* (2002) summarized information on the Psocoptera of Indonesia, and emphasized that some major parts of this complex archipelago have scarcely been investigated for these small insects. Their summary implied that the family Psocidae may be especially well represented in the region, with a few genera particularly complex and therefore important to clarify as tools to appraise the diversity and geographical relationships of the fauna. This paper is a further contribution to knowledge of the family Psocidae in Indonesia and deals with a regionally complex and diverse genus of the family, *Trichadenotecnum* Enderlein, in the large western island of Sumatra, which has hitherto been poorly surveyed. In this paper, we supplement information on the genus from more eastern parts of Indonesia (Endang *et al.*, 2002) to provide a more complete appraisal of *Trichadenotecnum* in Indonesia.

Sumatra is geographically important in indicating possible transitional faunal relationships with both West Malaysia and eastern Indonesia: indeed, it has been described as “the gateway to Indonesia” from Asia, and was

last connected to the Asian mainland only some 10 000 years ago. The second largest island in the archipelago (after Borneo), Sumatra has an area of about 475 000 km², and the Bukit Barisan Mountain Range extends for much of the length of the island. Psocoptera were collected by beating vegetation in the four most important National Parks in Sumatra (Fig. 1) (Way Kambas National Park [WKNP], Bukit Barisan Selatan National Park [BBSNP], Kerinci Seblat National Park [KSNP], Gunung Leuser National Park [GLNP or LRNP]), and from numerous areas outside the national parks. Latitude/longitude data for all localities are given to the nearest minute. Way Kambas is in the southeast lowlands, much of the area in and around the park being cultivated land, and the other three parks are founded on montane forest in the major range. Extensive areas of kebun cultivation (involving perennial crops in areas recently cleared of forest for cultivation) occur within and around these parks, so that varying levels of disturbance have occurred. Considerable information on these changes is provided by Laumonier (1997).

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Collections of Psocoptera were made (by ESK) on 66 days at intervals from December 1995–July 1997, and on all visits efforts were made to collect from a variety of different vegetation types up to altitudes of around 1500 m. During this survey, 72 species of Psocidae were collected, including 20 of *Trichadenotecnum*. The collections include 13 new species of this genus, which are described below, and collection records of all species are summarised. Of the previously described species, two are recorded in Indonesia for the first time, one of them described from Malaysia and the other from Nepal. The others were known previously from other parts of Indonesia. No *Trichadenotecnum* have been recorded previously from Sumatra.

Methods

Measurements of body length (B) and IO:D (by Badonnel's method, following Ball, 1943) were made from entire specimens in alcohol, and all other measurements (in mm) were from permanent slide-mounted material. Abbreviations are: FW, fore wing length; HW, hind wing length; F, length of hind femur; T, length of hind tibia; t_1 , t_2 , lengths of basal and distal hind tarsal segments; f_1 , f_2 , lengths of first and second antennal flagellar segments; Ct, number of ctenidiobothria on hind tarsal segments. Figures were made using a camera lucida, and scale lines on figures of terminalia represent 0.1 mm.

Holotypes and some paratype material will be deposited in the Zoological Museum, Bogor, Indonesia (ZMB) and, where possible, paratype and other voucher material also in the Australian Museum, Sydney (AMS), or in our collections.

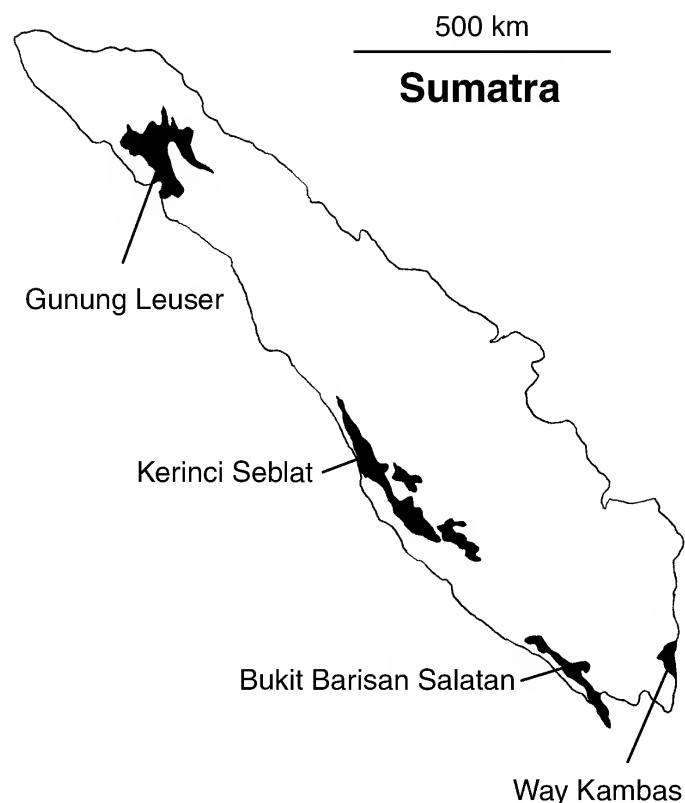


Fig. 1. Map of Sumatra, to show positions of national parks.

Checklist of species from Indonesia

This checklist and the following key exclude three Javan species *T. minutum*, *T. (Loensia) glabridorsum*, *T. (L.) fuscimacula*, described by Enderlein (1926) without genitalic descriptions or any figures. None of those types are available for study and their generic placement remains unconfirmed. An asterisk (*) denotes species recorded from Sumatra.

-
- * *Trichadenotecnum adika* Endang *et al.*, 2002
 - T. alinguum* Endang *et al.*, 2002
 - * *T. alobum* n.sp.
 - T. bidens* Thornton, 1961
 - T. bidentatum* Thornton, 1984
 - T. bromoense* Endang *et al.*, 2002
 - T. cheahae* Endang *et al.*, 2002
 - * *T. cinnamonomum* n.sp.
 - * *T. cornutum* n.sp.
 - T. galihi* Endang *et al.*, 2002
 - * *T. godavarensense* New, 1971
 - * *T. gombakense* New & Lee, 1992
 - T. hammani* Endang *et al.*, 2002
 - * *T. jambiense* n.sp.
 - * *T. kalibiruense* n.sp.
 - * *T. kerinciense* n.sp.
 - * *T. krucilense* Endang *et al.*, 2002
 - * *T. laticornutum* Endang *et al.*, 2002
 - * *T. malayense* New, 1975
 - * *T. muaraense* n.sp.
 - * *T. paradika* n.sp.
 - * *T. pardus* Badonnel, 1955
 - * *T. proctum* n.sp.
 - T. quadrispinosum* Endang *et al.*, 2002
 - T. rachimi* Endang & Thornton, 1992
 - T. santosai* Endang & Thornton, 1992
 - * *T. sibolangitense* n.sp.
 - T. soekarmanni* Endang *et al.*, 2002
 - T. soenarti* Endang *et al.*, 2002
 - * *T. sumatrense* n.sp.
 - T. vaghani* Endang *et al.*, 2002
 - * *T. waykambasense* n.sp.
 - * *T. waykananense* n.sp.
-

Genus *Trichadenotecnum* Enderlein

Trichadenotecnum Enderlein, 1909: 329. Type species: *Hemerobius sexpunctatus* Linnaeus.

Trichadenopsocus Roesler, 1943: 4. Type species: *Psocus desolatus* Chapman.

Historically, the scope of *Trichadenotecnum* has been confused, and ambiguities in its definition persist, with a number of included species difficult to assign convincingly and, in Yoshizawa's (2001) example, retained *pro tem.* in this genus simply because no other suitable genus has been raised to contain them. Lienhard & Smithers (2002) listed 78 described species of this widely distributed genus, including *Trichadenopsocus* as a synonym, following Mockford (1993). Mockford's generic scope was adopted also by Yoshizawa (2001), who confirmed *Trichadenotecnum* in that sense to be a monophyletic entity and described 15 further Japanese species. Endang *et al.* (2002) also followed this arrangement, and described 12 species from eastern Indonesia. However, Li (2002) reinstated *Trichadenopsocus* as a full genus, based on fore wing pattern (Li, 2002: 1902, English abstract: "The genus differs from the *Trichadenotecnum* in forewing without submarginal belt and noly [sic] spots"), and allocated 16 new Chinese species to this genus, in addition to a further 14 to his restricted sense *Trichadenotecnum*. Li had earlier (Li, 1997) erected another genus within the tribe Ptyctini (sensu Lienhard & Smithers, 2002), *Conothoracalis*, to contain several heavily-marked species with *Trichadenotecnum*-like venation, and also acknowledged the presence of *Loensia* Enderlein in China. Li (2002) included 9 and 22 Chinese species respectively in these genera. Although not included in his new tribe Trichadenotecnini, Li (2002) also raised *Cryptopsocus* as, in part, "related to *Trichadenotecnum*". Ambiguities of recognising species of *Trichadenopsocus*

are illustrated further by Li's transfer of species such as *Trichadenotecnum spiniserrulum* Datta to this genus; *T. spiniserrulum* is the foundation species for one of Yoshizawa's species groups in *Trichadenotecnum*, and there seems little practical advantage, or need, in shifting species uncritically at this stage. We suggest that Yoshizawa's appraisal, based on detection of testable apomorphies, forms a better basis for consideration (so that *Trichadenopsocus* should remain a synonym), and that his progressive removal of non-conforming species be advanced as evidence accumulates. Essential to such advance is the diagnosis of as many representative species as possible within the complex, a step to which the present paper is a contribution.

Trichadenotecnum sensu Yoshizawa (2001) as followed here thus contains around 135 described species, including the diverse Chinese fauna discussed by Li (2002). It is especially diverse in the eastern Palaearctic and Oriental regions, where its structural variety and possible taxonomic complexity have long been acknowledged (New, 1978). Yoshizawa erected five species groups from the Japanese fauna. However, several of the species described here, as with some eastern Indonesian taxa, have a wing pattern more resembling *Loensia*, in that the submarginal row of fore wing spots regarded as diagnostic by Yoshizawa is absent or entirely obscured by more intensive wing markings. These would correspond to the appearance of species placed in *Loensia* by Li (2002) but, because of ambiguities over their correct placement, are considered here as belonging to *Trichadenotecnum* s.l. In the following account, records and augmented descriptions of described species precede descriptions of new taxa.

Including the Sumatran taxa treated here, 33 species have now been reported from Indonesia, most of them known from singletons or few specimens. Although some species are geographically widespread, these may still be rather rare psocids.

Key to Indonesian species of *Trichadenotecnum*

Male

- 1 Fore wing pattern consisting of many (over 100) small pigment spots, with or without larger pigment patches 11
- Fore wing pattern consisting of less than 30 pigment patches, at least three apical cells with an isolated submarginal patch 2
- 2 Lateral extension of clunium as a long narrow blunt projection with a heavily spinous bulb at its base *T. arciforme*
- Lateral extension not as above, or absent 3
- 3 Phallosome a closed frame 4
- Phallosome open 7
- 4 Phallosome with apical tine 5
- Phallosome without apical tine 6
- 5 Hypandrium asymmetrical, with median rounded spinose lobe, a sharp spine to one side and two pairs of lateral spines *T. soenarti*
- Hypandrium symmetrical, two pairs of sharp spines *T. quadrispinosum*
- 6 Hypandrium symmetrical* (Fig. 13), with two pairs of large spines; epiproct with pair of rounded lobes *T. krucilense*

* The male holotype (from Java) has three hypandrial spines (fig. 333 of Endang *et al.* [2002])

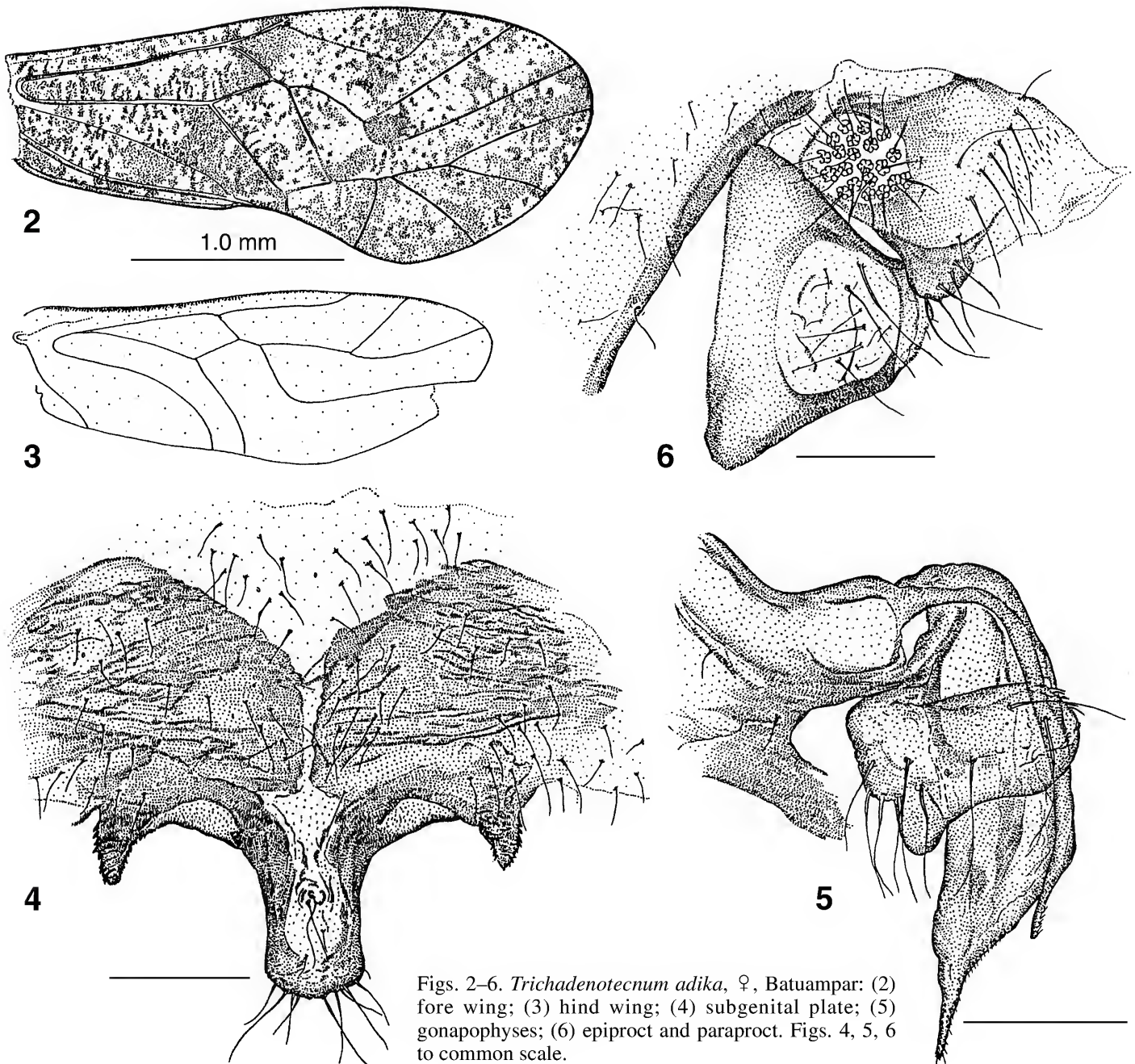
— Hypandrium asymmetrical, with single broad pointed spine and broad rounded lobe; epiproct with pair of trianguloid lobes	<i>T. santosai</i>
7 Hypandrium with truncate median spiculate lobe between a small narrow and a large broad spine	<i>T. vaughani</i>
— Hypandrium without truncate median lobe	8
8 Hypandrium with single large curved, serrated projection on one side	9
— Hypandrium not as above	10
9 Epiproct with rounded spiculate lobe at each posterior corner, clunium with narrow straight spine near lateral margin	<i>T. sibolangitense</i> n.sp.
— Epiproct with trapezoid posterior projection bearing three marginal setae, and median stout spine near base of epiproct; clunium with finely setose broad hook-like lobe at each margin	<i>T. alinguum</i>
10 Phallosome with median broad blunt projection anteriorly; hypandrium with pair of broad hooked blunt projections and narrower shorter straight spinous projection to one side of mid-line	<i>T. galihi</i>
— Phallosome without median projection, hypandrium with two pairs of spines, one pair bulbous basally	<i>T. cornutum</i> n.sp.
11 Phallosome open	12
— Phallosome a closed frame	14
12 Hypandrial tongue spinose	13
— Hypandrial tongue as a single pointed spine	<i>T. kalibiruense</i> n.sp.
13 Hypandrial tongue diamond-shaped; epiproct not heavily sclerotized	<i>T. muaraense</i> n.sp.
— Hypandrial tongue a straight projection with a slightly bulbous spinous apex; epiproct narrowly trapezoid with sclerotized margins, pair of hooked-shaped sclerotizations apically	<i>T. proctum</i> n.sp.
14 Hypandrium symmetrical	15
— Hypandrium asymmetrical	19
15 Hypandrium with two apical pairs of pointed prongs, one large, one small	16
— Hypandrium with one pair or no pairs of pointed prongs	18
16 Clunium with broad short spinous bluntly-pointed lateral projections	<i>T. bidentatum</i>
— Clunium with long narrow acutely-pointed lateral projection	<i>T. bidens</i>
17 Phallosome apical tine bifid, its arms curved and slightly hooked	<i>T. godavarensense</i>
— Phallosome apical tine single	18
18 Hypandrium with pair of stout slightly curved spines, tongue broad, divided apically, tongue broad, divided apically, spinous; phallosome with spines on anterior margin	<i>T. adika</i>
— Hypandrium with pair of spinous lobes, tongue absent, pair of long, sinuous tines, phallosome without spines on anterior margin	<i>T. malayense</i>
19 Phallosome apical tine bifid	<i>T. cinnamonum</i> n.sp.
— Phallosome apical tine undivided	20
20 Phallosome with apical tine broader than long, surface of basal margin of phallosome without spines	<i>T. bromoense</i>
— Phallosome with apical tine at least twice as long as broad, basal margin of phallosome with pair of shallow lobes beset with short spines	21

- 21 Hypandrium with long narrow bluntly-ending projection and small short spine to one side of mid-line *T. soekarmanni*
- Hypandrium with spinous tongue curved lateral, a large stout median spine *T. gombakense*

Female

- 1 Fore wing pattern consisting of (over 100) small pigment spots, with or without larger patches 9
- Fore wing pattern consisting of fewer than 30 pigment patches, an arc of at least four distinct isolated submarginal patches, one in each apical cell 2
- 2 Subgenital plate with pointed lateral “horn” each side of apical lobe 3
- Subgenital plate without projections lateral to apical lobe 4
- 3 Subgenital plate apical lobe twice as long as broad, disc with pattern of hook-shaped sclerotization and small isolated sclerotized patch each side *T. waykananense* n.sp.
- Subgenital plate apical lobe as broad as long, disc without hook-shaped pattern, without isolated patches *T. laticornutum*
- 4 Ventral valve of gonapophyses almost as long as dorsal valve *T. kerinciense* n.sp.
- Ventral valve of gonapophyses less than half as long as dorsal valve 5
- 5 Sclerotized pattern of subgenital plate disc weaker or absent medially, two almost separate lateral sclerotized areas 6
- Sclerotized pattern of subgenital plate disc continuous across mid-line 8
- 6 Surface of subgenital plate apical lobe with central distinct field of setae; sclerotization of disc in U-shaped pattern *T. arciforme*
- Subgenital plate apical lobe with scattered setae over surface, not a distinct field, sclerotization of disc not U-shaped 7
- 7 Subgenital plate disc with ornamented “basket-like” pattern centrally; apical lobe with fine setae along posterior margin *T. santosai*
- Subgenital plate disc without central “basket-like” pattern of sclerotization; apical lobe with row of marginal setae of various lengths, median pair long and stout *T. rachimi*
- 8 Spermapore plate pattern of sclerotization with lateral curved “horns”; areola postica of fore wing almost completely hyaline *T. galihi*
- Spermapore plate pattern of sclerotization with broad curved area of sclerotization each side of mid-line; areola postica with pigment over posterodistal two-thirds *T. soenarti*
- 9 Ventral valve of gonapophyses short, less than half length of dorsal valve 10
- Ventral valve of gonapophyses more than two thirds length of dorsal valve 14
- 10 Outer valve of gonapophyses with row of denticles along posterior or mesial margin; a spiral or concentric patch of sclerotization each side of apical lobe of subgenital plate basally *T. pardus*
- Outer valve without denticles; subgenital plate without concentric or spiral sclerotizations 11

- 11 Apical lobe of subgenital plate broad basally, narrowing towards apex, then broadening apically; outer valve of gonapophyses without posterior lobe 12
- Apical lobe of subgenital plate more or less straight-sided, rectangular; outer valve of gonapophyses with small posterior lobe 13
- 12 Apical lobe of subgenital plate with distinct “neck”, half as broad as apical margin; outer valve with curved posteroventral spine *T. malayense*
- Apical lobe of subgenital plate without distinct “neck”, narrowest part only slightly narrower than posterior margin; outer valve without curved spine *T. godavarensense*
- 13 Subgenital plate disc with median unsclerotized area at least 1.5 × wider than sclerotized area on either side of it *T. gombakense*
- Subgenital plate disc with median unsclerotized area no wider than sclerotized area on either side of it *T. soekarmanni*
- 14 Subgenital plate with a lateral spinous protuberance each side of apical lobe 15
- Subgenital plate without a lateral spinous protuberance each side of apical lobe 16
- 15 Subgenital plate lateral protuberance longer than width at base, subconical, surface spinous *T. adika*
- Subgenital plate lateral protuberance no longer than width at base, subconical, surface rugose *T. paradika* n.sp.
- 16 Outer valve of gonapophyses without distinct posterior lobe 17
- Outer valve of gonapophyses with distinct posterior lobe 20
- 17 Outer valve of gonapophyses with spine or group of spines on mesial margin 18
- Outer valve of gonapophyses without spines on mesial margin 19
- 18 Outer valve of gonapophyses with single short broad spine *T. sumatrense* n.sp.
- Outer valve of gonapophyses with three close-set short spines *T. cinnamomum* n.sp.
- 19 Apical lobe of subgenital plate convex-sided, vase-shaped *T. bromoense*
- Apical lobe of subgenital plate concave-sided *T. alobum* n.sp.
- 20 Apical lobe of subgenital plate broad basally, narrowing to setose apex that is less than one-fifth width of lobe at base *T. cheahae*
- Apical lobe of subgenital plate broad basally with apical margin more than one-third width of lobe at base 21
- 21 Subgenital plate with papillose “shoulders” basal to apical lobe *T. bidens*
- Subgenital plate without such ornamentation 22
- 22 Subgenital plate with sclerotized transverse bar at base of apical lobe 23
- Subgenital plate without sclerotized transverse bar at base of apical lobe 24
- 23 Subgenital plate apical lobe with central unsclerotized oval area beset with setae, without pair of long setae at base of lobe *T. jambiense* n.sp.
- Subgenital plate apical lobe without such an unsclerotized area, with pair of long setae at base of lobe *T. waykambasense* n.sp.
- 24 Subgenital plate apical lobe with isolated central heavily sclerotized setose area, without a pair of long setae at base of lobe *T. bidentatum*
- Subgenital plate apical lobe without isolated central heavily sclerotized setose area, with a pair of long setae at base of lobe *T. hammani*



Figs. 2–6. *Trichadenotecnum adika*, ♀, Batuampar: (2) fore wing; (3) hind wing; (4) subgenital plate; (5) gonapophyses; (6) epiproct and paraproct. Figs. 4, 5, 6 to common scale.

***Trichadenotecnum adika* Endang, Thornton & New**

Figs. 2–6

Trichadenotecnum adika Endang *et al.*, 2002: 166.

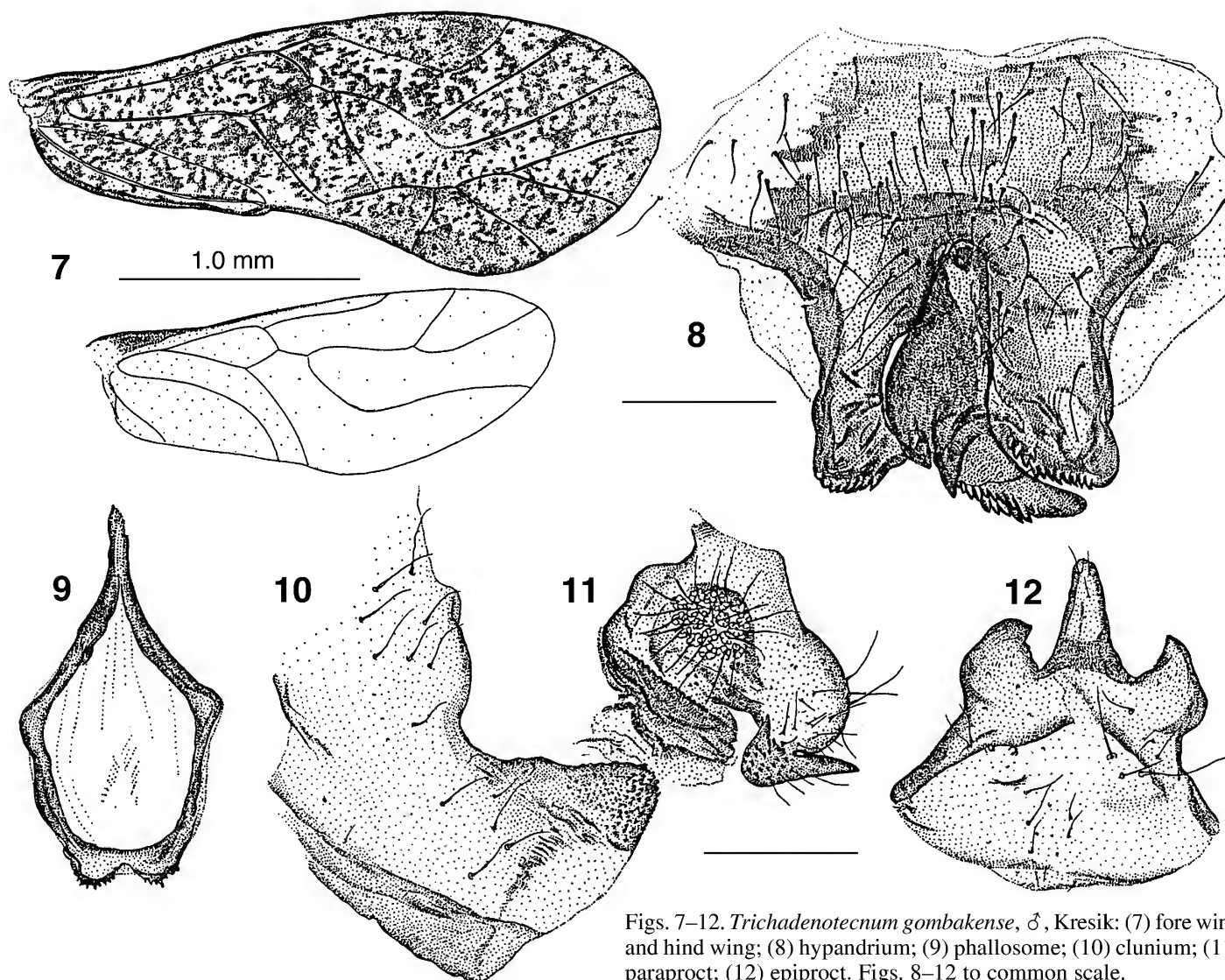
Material examined. **Sumatra:** West, Batuampar, tea plantation, 1°44'S 101°20'E, 1360 m, 1♂, 3♀♀, 21.I.1997; 1♂, 1♀, 19.VI.1997, ESK. West, PTPN VI, tea plantation, 1°46'S 101°22'E, 1460 m, 1♂, 2♀♀, 19.VI.1997, ESK (vouchers of each sex to ZMB, AMS).

Female

Colouration (after c. 3 years in alcohol). Head yellowish. Epicranial suture dark brown, dark brown confluent patches each side extending to posterior margin of vertex and mesial to each orbit. Eyes greyish black. Ocelli pale, black centripetally. Brown spot each side adjacent to lateral ocelli. Dark brown stripe from median ocellus toward orbits. Frons with dark brown stirrup-shaped mark and lateral curved dark brown mark. Antennal socket bordered with dark brown band. Antenna light brown, except ventral side of scape and

pedicel dark brown. Gena yellowish, with dark brown curved band from ventral margin toward antennal socket. Epistomal suture brown. Clypeal striae dark brown, merging anteriorly, paler lateroanteriorly. Dorsal half of anteclypeus dark brown, otherwise whitish. Labrum dark brown. Maxillary palp dark brown, intersegmental areas pale. Thorax: dorsal lobe brown pale along suture; antedorsum of mesothorax yellowish brown with median pale band; lateral lobe dark brown. Fore wing with brown spots as in Fig. 2. Hind wing (Fig. 3) suffused brown. Legs: coxa and femur dark brown, tibia and tarsal segments light brown, joints pale.

Morphology. IO:D 2.5, eyes small. Fore wing (Fig. 2): first and second sections of vein Cu_{1a} in a straight line; angle of divergence of arms of radial fork about 90°; Ct 20 (t_1) 2 (t_2); subgenital plate (Fig. 4): posterior lobe long, not tapering apically and with long apical setae, two long setae in the middle of the posterior lobe; main plate setose, with lateral conical spiculate projections. Gonapophyses (Fig.



Figs. 7–12. *Trichadenotecnum gombakense*, ♂, Kresik: (7) fore wing and hind wing; (8) hypandrium; (9) phallosome; (10) clunium; (11) paraproct; (12) epiproct. Figs. 8–12 to common scale.

5): dorsal valve with small fine setae on dorsal margin apically, narrow finely setose apical tine; ventral valve short, with bluntly ending narrow apex; outer valve transverse with short posterior lobe and bearing long setae. Epiproct (Fig. 6) trapezoidal with lateral sclerotized prong. Paraproct (Fig. 6) with field of about 23 trichobothria.

Remarks. Endang *et al.* (2002) described this species from a single male specimen collected from Bandung, West Java, at an elevation of 700 m. The female was then unknown. *Trichadenotecnum adika* has a *Loensia* type fore wing pattern (with many small pigment spots over the whole wing membrane and no or indistinct larger submarginal spots in the outer cells) (Thornton, 1961). The material examined above differs from any other Oriental species in details of hypandrium and phallosome. The Sumatran males are clearly referable to *T. adika* and were captured with six females (in three separate samples), so that the sexes are associated clearly. In subgenital plate features, the species resembles *T. laticornutum* (Endang *et al.*, 2002) in having a lateral sclerotized horn-shaped projection on the main plate. The size and shape of this projection, however, is somewhat different; in *T. adika* it is short, tapering distally and conical, whereas in *T. laticornutum* it is long and acuminate distally. *Trichadenotecnum paradika* n.sp., described below, also has a subgenital plate of this rather unusual form.

The posterior lobe of the subgenital plate of *T. laticornutum* is shorter than that of *T. adika*. Furthermore, *T. laticornutum* has a wing pattern conforming to *Trichadenotecnum* Enderlein *sensu stricto*, whereas the pattern in *T. adika* is *Loensia*-like, as is that of *T. paradika*. The above females are clearly referred to *T. adika* on head and fore wing pattern and in general colouration. *Trichadenotecnum adika* was taken only at high elevations.

Trichadenotecnum gombakense New & Lee

Figs. 7–12

Trichadenotecnum gombakensis New & Lee, 1992: 155.

Material examined. Sumatra: SW, Pekon Balak, 4°20'S 104°30'E, cinnamon, 1160 m, 1 ♀, 9.I.1996, ESK; West, PTP Nusantara III, Bedeng Lapan, 2°00'S 101°27'E, tea plantation, 1460 m, 1 ♂, 21.I.1997, ESK; West, Kresik tuo, 1°45'S 101°20'E, tea plantation, 1 ♂, 3 ♀, 22.I.1997, ESK (vouchers of each sex to ZMB, AMS).

Male

Colouration (c. 4 years in alcohol) similar to female, except labrum brown and anteclypeus whitish.

Morphology. IO:D 0.58. Fore wing venation as in Fig. 7. Hypandrium (Fig. 8) asymmetrical: a row of teeth on each margin of tongue, a large toothed apical projection curved

to left, a large stout spine just to left and a shorter one to right of middle of apical margin. Phallosome (Fig. 9) a closed frame with long anterior projection, posteriorly with a pair of low serrated lobes. Epiproct (Fig. 12) broad curved hook each side and a long conical projection distally. Paraproct (Fig. 11) with apical spine, long serrated basal sclerotized ridge, field of about 20 trichobothria. Posterior margin of clunium with a broad rugose lobe each side (Fig. 10).

Dimensions. B 1.5; FW 2.8; HW 1.96; F 0.45; T 0.89; t_1 0.31; t_2 0.08; t_1/t_2 3.87; Ct (t_1) (t_2); f_1 0.44; f_2 0.35; f_1/f_2 1.26.

Remarks. This species was described from female specimens from the Malay Peninsula by New & Lee (1992), and the male has not been recognized previously. The specimen examined is clearly similar in non-sexual characters to *T. gombakense* New. The heavily marked fore wing with indistinct submarginal spots resembles that of *T. bidens* Thornton (1961) from Hong Kong. The ventral gonapophysis valve of *T. bidens* is long, however, and that of *T. gombakense* is short. Although the sides of the subgenital plate apex are sclerotized in both species, the apical lobe in *T. bidens* arises from a very distinct projection or “shoulder”. *Trichadenotecnum gombakense* is thus distinct from *T. bidens* and is a probable member of Yoshizawa’s (2001) *spiniserrulum* group.

One male was found in association with females in recent collections. The phallosome and paraprocts resemble those of *T. soekarmanni* Endang *et al.* (2002) from central Java, but the specimen differs in details of hypandrium and male epiproct. The hypandrium of *T. gombakense* is similar to that of *T. dolabratum* Li & Yang, 1987 (placed in *Loensia* by Li, 2002) from China in the shape of the median tongue, but the phallosome of *T. dolabratum* lacks the posterior serrated lobes. Yoshizawa (2001) described *T. falx* from Japan, allocating it to his *spiniserrulum* group, and it is clearly similar to *T. gombakense* New in wing pattern and details of the female genitalia. Yoshizawa noted two types of wing pattern: densely spotted and sparsely spotted. The fore wing of the holotype of *T. gombakense* (female) is densely spotted. The male genitalic features of *T. falx* are clearly similar to those of the male from Sumatra. Based on the similarity of the wing pattern and its association with the female of *T. gombakense* this male is referred to this species, which was taken only at high elevation in Sumatra.

Trichadenotecnum godavarensense New

Trichadenotecnum godavarensense New, 1971: 197.

Material examined. Sumatra: SW, BBSNP, Skincaw, 4°53'S 104°18'E, coffee, 1200 m, 1 ♀, 28.VI.1997, ESK; BBSNP, Sukaraja, 5°22'S 104°23'E, mixed cultivated trees, 400 m, 1 ♀, 25.VI.1997, ESK; West, Jambi, Telun Berasap, Leter W, 1°12'S 101°10'E, citrus, 1320 m, 1 ♀, 19.VI.1997, ESK (one voucher each to ZMB, AMS).

Remarks. This species was described by New (1971) from material collected in Godavari, Katmandu, Nepal. The above specimens are clearly referable to *T. godavarensense* from the wing pattern and terminalia, in which the subgenital plate has a bifurcate sclerotized region on the disc and a blunt apical lobe, a short dorsal gonapophysis valve and an outer valve without a posterior lobe. This constitutes the first record of the species from Indonesia.

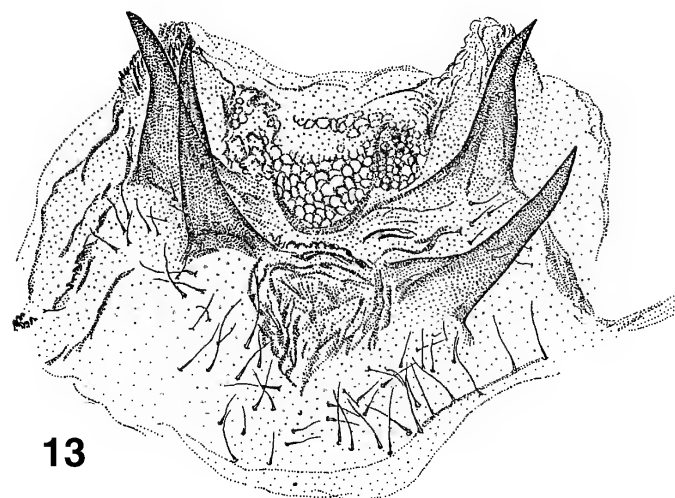


Fig. 13. *Trichadenotecnum krucilense*, ♂, BBSNP, Lombok: (13) hypandrium.

Trichadenotecnum krucilense Endang, Thornton & New

Fig. 13

Trichadenotecnum krucilensis Endang *et al.*, 2002: 165.

Material examined. Sumatra: SW, BBSNP, Lombok, 4°44'S 103°57'E, cinnamon, 540 m, 1 ♂, 26.VII.1997, ESK.

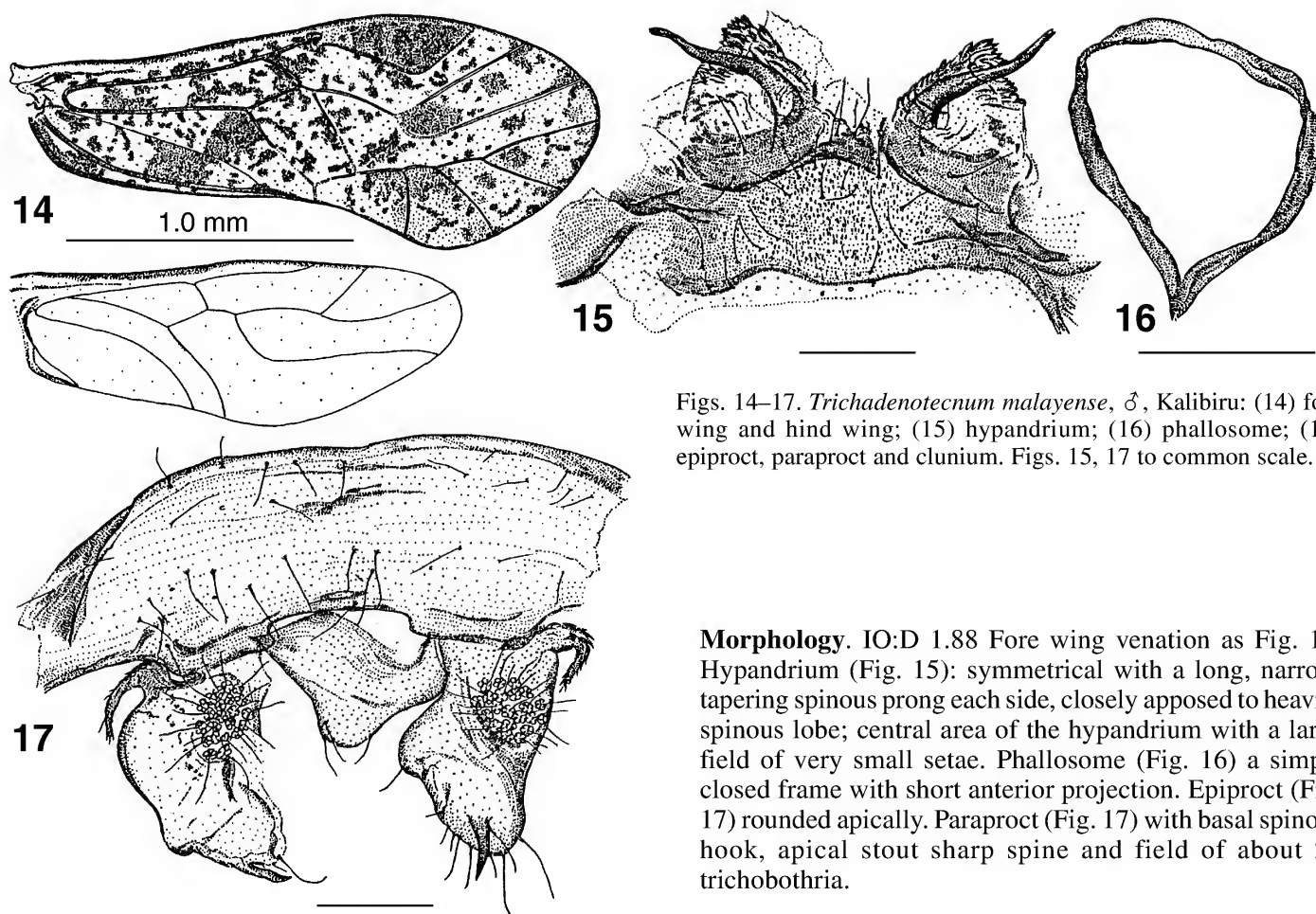
Remarks. This species was described from male material collected at moderate elevation (750 m) in East Java in December 1991. The female is unknown. The above Sumatran specimen agrees with specimens of *T. krucilense* from Java in wing pattern and features of the genitalia. However, the Sumatran male’s hypandrium differs from that of the type in that it has four lateroanterior spikes (Fig. 13) instead of three. This difference might represent intra-specific variation but, alternatively, the individuals might represent distinct species. Despite this difference, we place this specimen in *T. krucilense* and figure its hypandrium in order to facilitate further appraisal.

Trichadenotecnum laticornutum Endang, Thornton & New

Trichadenotecnum laticornutum Endang *et al.*, 2002: 158.

Material examined. Sumatra: West, KSNP, Base camp, 1°41'S 101°13'E, pine, 1600 m, 1 ♀, 22.I.1997, ESK; SW, BBSNP, Palimpangan Liwa, 4°56'S 104°10'E, cloves, 1000 m, 1 ♀, 11.I.1996, ESK (both ZMB); BBSNP, Bukit Penetoh Kubuperahu, 4°54'S 104°10'E, secondary forest with remnants of cultivation, 500 m, 1 ♀, 27.VI.1997, ESK (AMS).

Remarks. Endang *et al.* (2002) described *T. laticornutum* from material collected in Central and East Java in 1991. It can be distinguished from other previously described species by the unusual form of the subgenital plate, with a horn-shaped projection each side of the main lobe. The Sumatran specimens have wing markings and genitalic features similar to those of Javan individuals and, although the posterior lobe of the subgenital plate is relatively longer, we believe them to represent the same species.



Figs. 14–17. *Trichadenotecnum malayense*, ♂, Kalibiru: (14) fore wing and hind wing; (15) hypandrium; (16) phallosome; (17) epiproct, paraproct and clunium. Figs. 15, 17 to common scale.

Trichadenotecnum malayense New

Figs. 14–17

Trichadenotecnum malayense New, 1975: 257.

Material examined. **Sumatra:** SE, WKNP, Kalibiru, 5°06'S 105°49'E, mixed secondary forest, 20 m, 3♂♂ 2♀♀, 2.VII.1997, ESK; WKNP, Way Kanan, 5°04'S 105°42'E, mixed secondary forest, 20 m, 2♂♂, 1.VII.1997, ESK; WKNP, Kiara tunggal, 5°06'S 105°44'E, mixed secondary forest, 100 m, 1♀, 29.XII.1995, ESK; WKNP, Kalibiru, 4°57'S 105°50'E, mixed secondary forest, 40 m, 1♀, 31.XII.1995, ESK; SW, BBSNP, North Slope of Mt Skincau, 4°53'S 104°17'E, mixed primary forest, 1500 m, 1♂ 1♀, 2.I.1996, ESK; BBSNP, Skincau, 4°52'S 104°18'E, mixed cultivated trees, 1400 m, 1♀, 2.I.1996, ESK; North, LRNP, Ketambe, 3°32'N 97°40'E, mixed secondary forest, 325–560 m, 2♀♀, 6.VI.1996, ESK (vouchers of each sex to ZMB, AMS).

Male

Colouration (c. 4 years in alcohol). Head ground colour yellowish brown. Epicranial suture dark brown, confluent brown patches each side extending to posterior margin of vertex and mesial to each orbit. Eyes black. Ocelli pale black centripetally. A narrow brown band from central ocellus toward each antennal socket. Frons with median broad brown band, lateral to this a dark brown spot. Antenna light brown. Gena unmarked. Epistomal suture dark brown. Postclypeus with distinctive dark brown striation. Basal quarter of anteclypeus dark brown, otherwise pale. Labrum and maxillary palp dark brown. Thorax predominantly dark brown with small paler areas between lobes. Fore wing with dark brown markings as figured (Fig. 14). Legs dark brown, pale between joints.

Morphology. IO:D 1.88 Fore wing venation as Fig. 14. Hypandrium (Fig. 15): symmetrical with a long, narrow, tapering spinous prong each side, closely apposed to heavily spinous lobe; central area of the hypandrium with a large field of very small setae. Phallosome (Fig. 16) a simple closed frame with short anterior projection. Epiproct (Fig. 17) rounded apically. Paraproct (Fig. 17) with basal spinous hook, apical stout sharp spine and field of about 21 trichobothria.

Dimensions. B 1.5; FW 2.1; HW 1.52; F 0.37; T 0.73; t_1 0.26; t_2 0.1; t_1/t_2 2.6; Ct 17 (t_1) 2 (t_2); f_1 0.42; f_2 0.35; f_1/f_2 1.2.

Remarks. This species was described from the Malay Peninsula and, although the species is also known from Java (Endang *et al.*, 2002), Bali and Lombok (Endang & Thornton, 1992), until now the male has been unknown. The above Sumatran specimens clearly resemble the Malaysian material in having the combination of a T-shaped apex to the subgenital plate, very short ventral valve of the gonapophyses and sclerotized posterior spine on the external valve. Four males were found in association with females in Sumatran collections. Based on wing pattern, colouration, and association with females, these male specimens are clearly referable to *T. malayense*. In Sumatra this species was collected at altitudes ranging from 20 m to 1500 m.

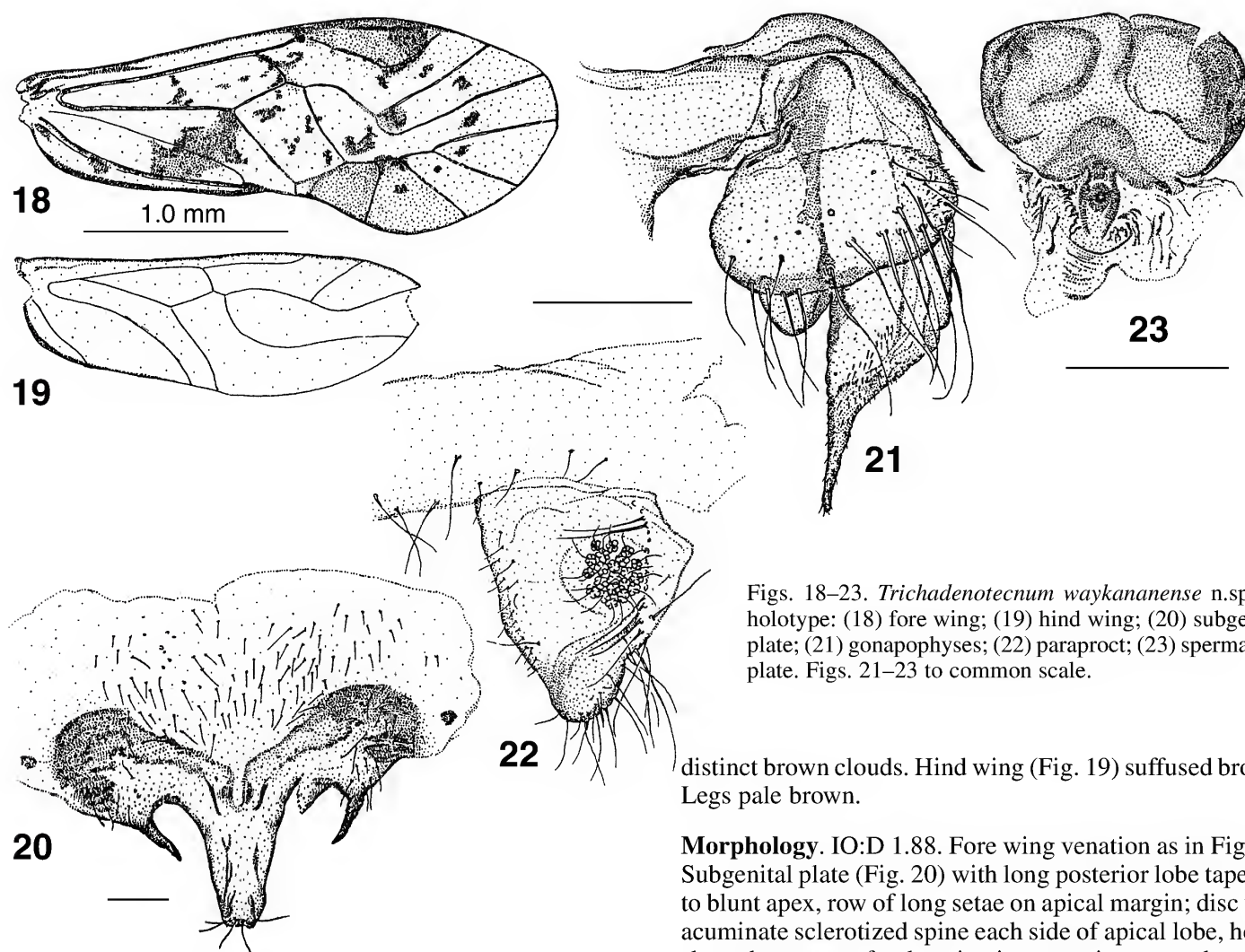
Trichadenotecnum pardus Badonnel

Trichadenotecnum pardus Badonnel, 1955: 231.

Trichadenotecnum pardidum Thornton, 1961: 16. (Badonnel, 1967: 193).

Material examined. **Sumatra:** SE, Palembang, 3°30'S 104°58'E, protected secondary forest, 20 m, 1♀, 25.I.1996, ESK (ZMB); SW, BBSNP, Sukaraja, 5°22'S 104°23'E, mixed cultivated trees, 400 m, 1♀, 25.VI.1997, ESK (AMS).

Remarks. This widely distributed species has been recorded in Indonesia only from Java (Endang *et al.*, 2002), but is known also from Singapore, Malaysia, Hong Kong and Japan in the southeast Asian region. The Sumatran specimens thus constitute the second record of the species from Indonesia. It was not found above 400 m in Sumatra.



Figs. 18–23. *Trichadenotecnum waykananense* n.sp., ♀ holotype: (18) fore wing; (19) hind wing; (20) subgenital plate; (21) gonapophyses; (22) paraproct; (23) spermapore plate. Figs. 21–23 to common scale.

Trichadenotecnum waykananense n.sp.

Figs. 18–23

Material examined. HOLOTYPE ♀, **Sumatra**: SE, Way Kambas National Park, Way Kanan, 5°06'S 105°49'E, mixed secondary forest, 20 m, 2.VII.1997, ESK (ZMB). PARATYPES, **Sumatra**: SE, WKNP, Kali Biru, 4°57'S 105°50'E, mixed secondary forest, 20 m, 4 ♀, 2.VII.1997, ESK (one each to ZMB, AMS K196199); South, Tanjung Bintang, 5°10'S 105°28'E, rubber plantation, 250 m, 1 ♀, 19.XII.1995, ESK; North, LRNP, Lawe Gurah, 3°38'N 97°40'E, mixed secondary forest, 325–360 m, 1 ♀, 5.VI.1997, ESK.

Male unknown.

Female

Colouration (c. 4 years in alcohol). Head yellowish. Epicranial suture dark brown with confluent brown patches each side across posterior margin of vertex and mesial to each orbit. Eyes greyish black. Ocelli pale black centripetally. Dark brown spot between eyes and lateral ocelli; anterior to this spot, a dark brown stripe toward anterior of eyes angled toward epistomal suture and merging with lateral dark brown mark on frons, appearing as a hook-shape. Epistomal suture pale. Clypeal striae dark brown, merging medially, appearing as yellowish area laterally. Gena with parallel dark brown bands ventral to orbit. Anteclypeus dark brown. Labrum whitish brown. Maxillary palp yellowish except apical segment dark brown. Antenna brown. Thorax generally yellowish, brown on thoracic scutella and centre of mesothoracic antedorsum. Fore wing as in Fig. 18 with

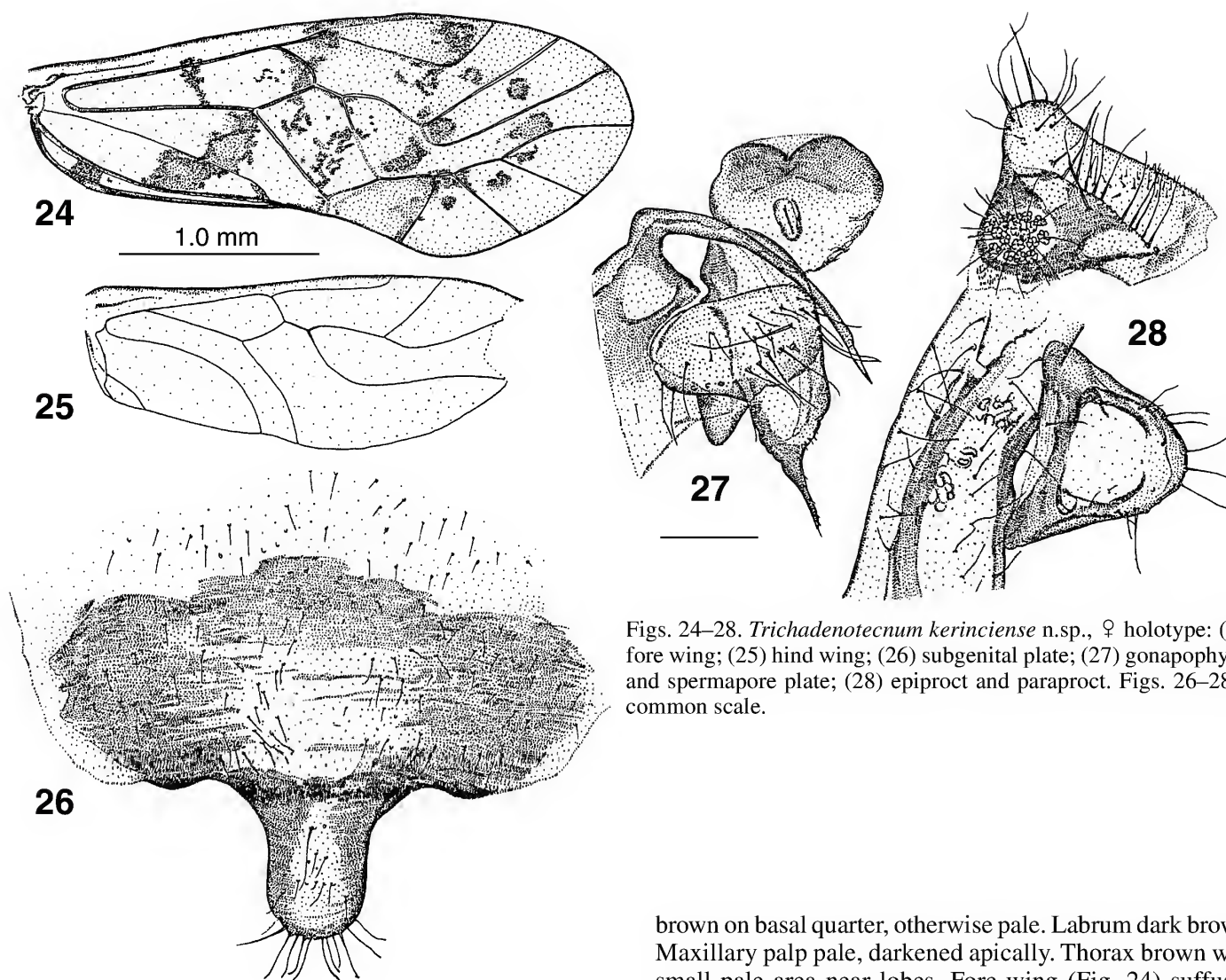
distinct brown clouds. Hind wing (Fig. 19) suffused brown. Legs pale brown.

Morphology. IO:D 1.88. Fore wing venation as in Fig. 18. Subgenital plate (Fig. 20) with long posterior lobe tapering to blunt apex, row of long setae on apical margin; disc with acuminate sclerotized spine each side of apical lobe, hook-shaped pattern of sclerotization anterior to each spine. Gonapophyses (Fig. 21): dorsal valves very short, with long apical spine; ventral valve broad with long setose apical spine; outer valve broad with short posterior lobe and very long stout setae towards its apex and row of shorter setae on posterior margin. Epiproct missing. Paraproct (Fig. 22) with field of about 21 trichobothria. Spermapore plate (Fig. 23) with heavy broad sclerotized area anterior to spermapore.

Dimensions. B 2; FW 2.6; HW 1.96; F 0.53; T 1.5; t_1 0.29; t_2 0.11; t_1/t_2 2.64; Ct 21 (t_1) 2 (t_2); f_1 0.55; f_2 0.54; f_1/f_2 1.01.

Remarks. The wing markings of this species conform to those of typical representatives of *Trichadenotecnum*. The subgenital plate resembles that of *T. laticornutum* Endang *et al.* (2002) by having lateral horn-shaped projections on the posterior margin, but the posterior lobe is longer than that of *T. laticornutum*. The general form of the gonapophyses is also similar in the two species but the outer valve of *T. waykananense* has a distinctly deeper posterior lobe than that of *T. laticornutum*, which is shallow. The fore wing of *T. waykananense* has a distinct brown sub-apical spot in each outer cell and the membrane is darkened on the apical margin, whereas in *T. laticornutum* the sub-apical brown patches are not clearly separated and the membrane is not darkened apically. Furthermore, the basal transverse fascia in the fore wing of *T. laticornutum* is broad and reaches the anterior margin of the wing, whereas in *T. waykananense* it is interrupted and only reaches vein Cu_1 .

This appears to be a lowland species.



Figs. 24–28. *Trichadenotecnum kerinciense* n.sp., ♀ holotype: (24) fore wing; (25) hind wing; (26) subgenital plate; (27) gonapophyses and spermapore plate; (28) epiproct and paraproct. Figs. 26–28 to common scale.

***Trichadenotecnum kerinciense* n.sp.**

Figs. 24–28

Material examined. HOLOTYPE ♀, **Sumatra**: West, Kerinci Seblat National Park, base camp, 1°41'S 101°14'E, 1600 m, beating pines, 23.I.1997, ESK (ZMB). PARATYPES 1♀ same data as holotype (ZMB); 8♀ ♀: **Sumatra**: West, KSNP, base camp, 1°41'S 101°14'E, pines, 1600 m, 3♀ ♀, 24.I.1997, ESK (two to AMS K196200 and K196201); KSNP, Base camp, pines, 1°40'S 101°14'E, 1540 m, 3♀ ♀, 20.VI.1997, ESK; West, Sumberjaya, 4°20'S 104°30'E, pines, 850 m, 2♀ ♀, 4.I.1996, ESK.

Male unknown.

Female

Colouration (c. 4 years in alcohol). Head ground colour yellowish. Epicranial suture with dark brown uniform band each side. Confluent brown patches on posterior margin of vertex and mesial to each orbit. Eyes black. Ocelli pale, black centripetally. A narrow brown stripe from central ocellus toward each antennal socket. Frons with median V-shaped mark, a hooked-shaped brown mark each side between median V-shaped mark and antennal socket. Antennal socket bordered with brown band. Antenna light brown. Gena pale. Epistomal suture dark brown. Post-clypeus pale with dark brown striations merging antero-medially and appearing as T-shaped mark. Anteclypeus dark

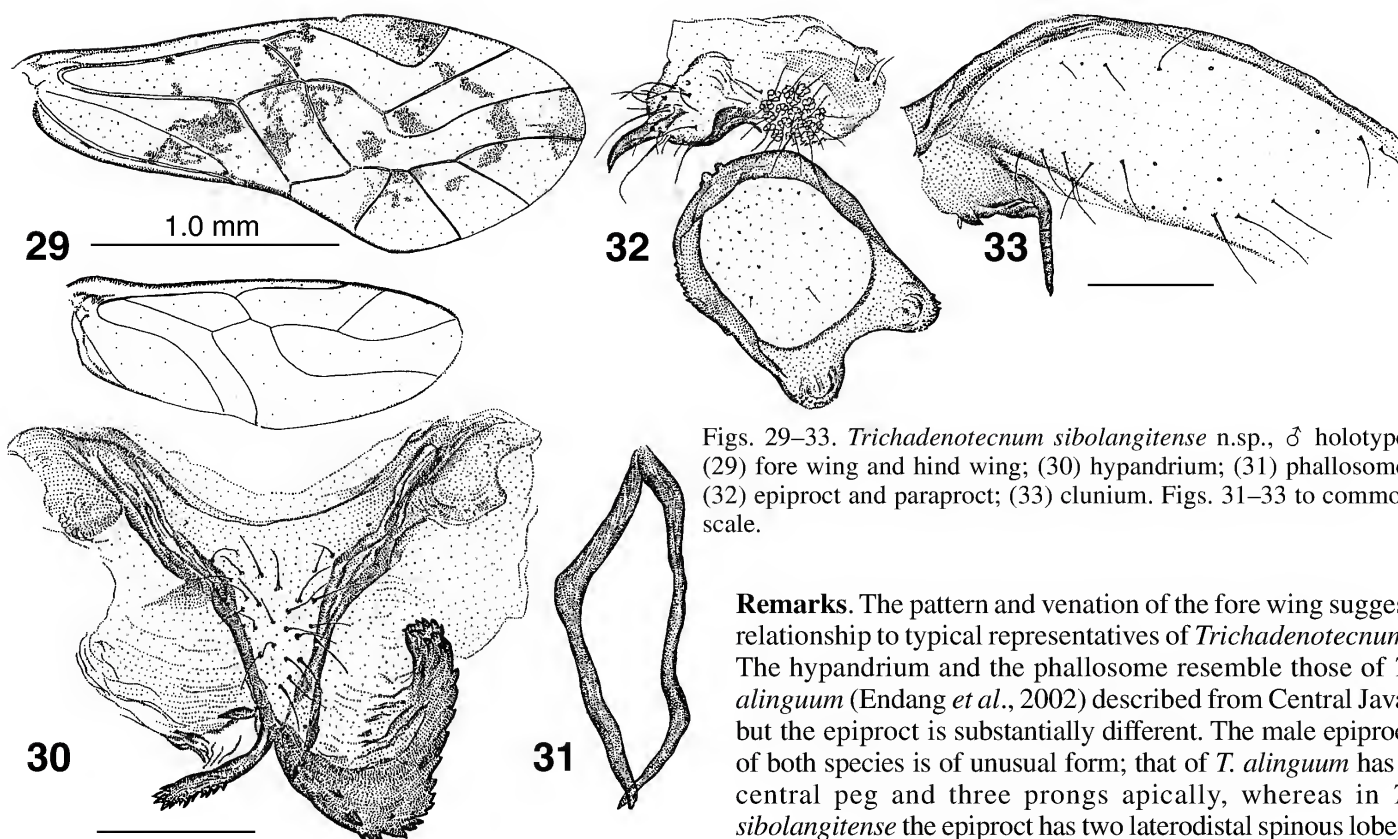
brown on basal quarter, otherwise pale. Labrum dark brown. Maxillary palp pale, darkened apically. Thorax brown with small pale area near lobes. Fore wing (Fig. 24) suffused faint brown with brown pattern. Hind wing (Fig. 25) suffused with light brown. Legs whitish except coxa, apical band on femur and tarsal segment dark brown.

Morphology. IO:D 2. Fore wing venation as in Fig. 24. Subgenital plate (Fig. 26) posterior lobe rounded apically with long setae; main plate with broad sclerotized area, a field of short and long setae along midline of posterior lobe. Gonapophyses (Fig. 27) ventral valve elongate, pointed apically; dorsal valve broad, with long acuminate apex; outer valve broad, setose, with short conical posterior lobe. Spermapore plate (Fig. 27) heavily sclerotized anteriorly. Epiproct (Fig. 28) with fine long setae on the apical margin. Paraproct (Fig. 28) with field of about 20 trichobothria.

Dimensions. B 2.5; FW 3.22; HW 2.4; F 0.73; T 1.2; t_1 0.36; t_2 0.1; t_1/t_2 3.6; Ct 21 (t_1) 2 (t_2); f_1 0.62; f_2 0.58; f_1/f_2 1.06.

Remarks. This species closely resembles *T. galihi* (Endang *et al.*, 2002) and *T. apertum* Thornton from Hong Kong in the form of the female subgenital plate. However, the ventral gonapophysis valve of *T. kerinciense* is longer than in those two species, and the spermapore plate lacks the lateral sclerotized hook apparent in those of *T. apertum* and *T. galihi*. It is attributed tentatively to Yoshizawa's (2001) *majus* group.

Trichadenotecnum kerinciense appears to be a highland species; it was not taken below 850 m.



Figs. 29–33. *Trichadenotecnum sibolangitense* n.sp., ♂ holotype: (29) fore wing and hind wing; (30) hypandrium; (31) phallosome; (32) epiproct and paraproct; (33) clunium. Figs. 31–33 to common scale.

Remarks. The pattern and venation of the fore wing suggest relationship to typical representatives of *Trichadenotecnum*. The hypandrium and the phallosome resemble those of *T. alinguum* (Endang *et al.*, 2002) described from Central Java, but the epiproct is substantially different. The male epiproct of both species is of unusual form; that of *T. alinguum* has a central peg and three prongs apically, whereas in *T. sibolangitense* the epiproct has two laterodistal spinous lobes.

***Trichadenotecnum sibolangitense* n.sp.**

Figs. 29–33

Material examined. HOLOTYPE ♂, **Sumatra:** North, Sibolangit, 3°05'S 98°48'E, mixed protected primary forest, 500 m, 31.I.1997, ESK (ZMB).

Female. Unknown.

Male

Colouration (c. 4 years in alcohol). Head generally buff. Epicranial suture dark brown with light brown confluent patches each side extending to posterior margin of vertex, and mesial to each orbit. Eyes black. Ocelli pale, black centripetally. Frons unmarked. Gena suffused brown. Antenna brown. Epistomal suture light brown. Postclypeus, anteclypeus and labrum brown. Maxillary palp brown darkened apically. Thorax: dorsal lobe buff; anterior of mesothoracic antedorsum brown; pleura brown with small buff patches. Fore wing (Fig. 29) with subapical brown clouds in apical cells and short basal transverse fascia. Legs dark brown, pale between joints.

Morphology. IO:D 1.2. Fore wing venation as in Fig. 29. Hypandrium (Fig. 30) highly asymmetrical: large curved serrated projection on one side apically and shorter, narrower spinous projection on the other; a median field of long setae. Phallosome (Fig. 31) an open frame, tips of open end overlapping distally. Epiproct (Fig. 32) with laterodistal spinous lobes. Paraproct (Fig. 32) with long apical spine and field of about 19 trichobothria. Clunium (Fig. 33) with long lateral spiculate spine.

Dimensions. B 2.0; FW 2.4; HW 1.57; F 0.42; T 0.78; t_1 0.23; t_2 0.08; t_1/t_2 2.9; Ct 17 (t_1) 2 (t_2); f_1 0.45; f_2 0.4; f_1/f_2 1.13.

***Trichadenotecnum kalibiruense* n.sp.**

Figs. 34–39

Material examined. HOLOTYPE ♂, **Sumatra:** SE, Way Kambas National Park, Kali Biru, 4°58'S 105°52'E, mixed secondary forest, 20 m, 2.VII.1997, ESK (ZMB).

Female unknown.

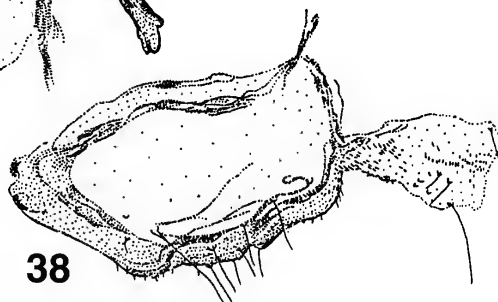
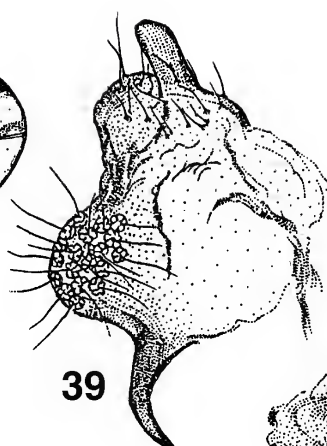
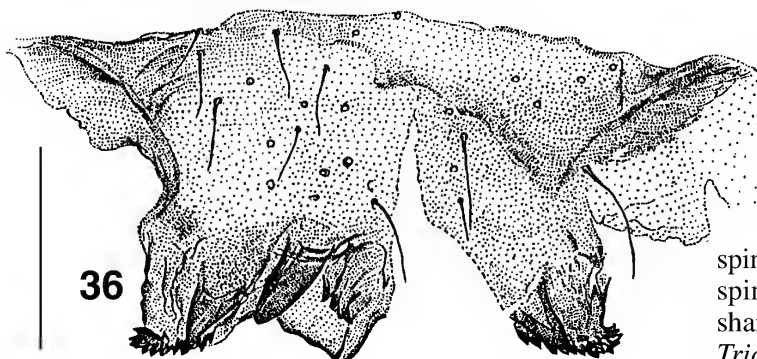
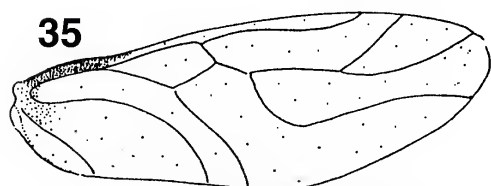
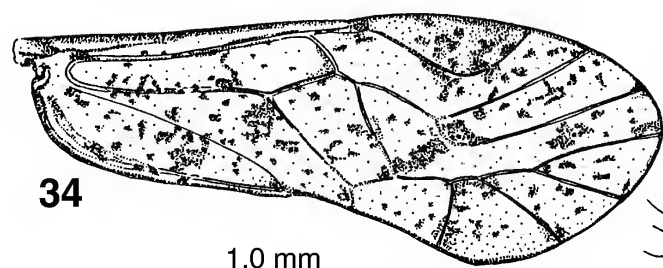
Male

Colouration (c. 4 years in alcohol). Generally brown, with the following exceptions; ocelli pale; eyes and central area between ocelli black; basal ¼ of anteclypeus dark brown, otherwise pale. Fore wing with scattered brown clouds as in Fig. 34. Hind wing suffused brown (Fig. 35).

Morphology. IO:D 2.75. Fore wing venation as in Fig. 34. Hypandrium (Fig. 36) symmetrical: distal row of short sharp teeth each side, a large stout spine at base of each row, and a larger central pointed projection. Phallosome (Fig. 37) an open frame, bilobed anteriorly. Epiproct shallow trapezoidal (Fig. 38). Paraproct (Fig. 39) with basal sclerotized hook and field of about 19 trichobothria.

Dimensions. B 1.5; FW 1.9; HW 1.38; F 0.33; T 0.73; t_1 0.23; t_2 0.08; t_1/t_2 2.88; Ct 17 (t_1) 2 (t_2); f_1 0.23; f_2 0.22; f_1/f_2 1.04.

Remarks. In wing pattern and genitalia features, *T. kalibiruense* differs from any Oriental species of *Trichadenotecnum* described previously. The hypandrium is similar to those of *T. masoni* New from Nepal and *T. bromoense* Endang *et al.* from Mt Bromo, East Java. All three have a lateral serration of the apical lobe and a single large central projection. *Trichadenotecnum masoni* and *T. bromoense*, however, lack the pair of large symmetrical

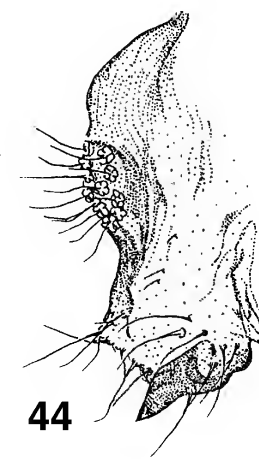
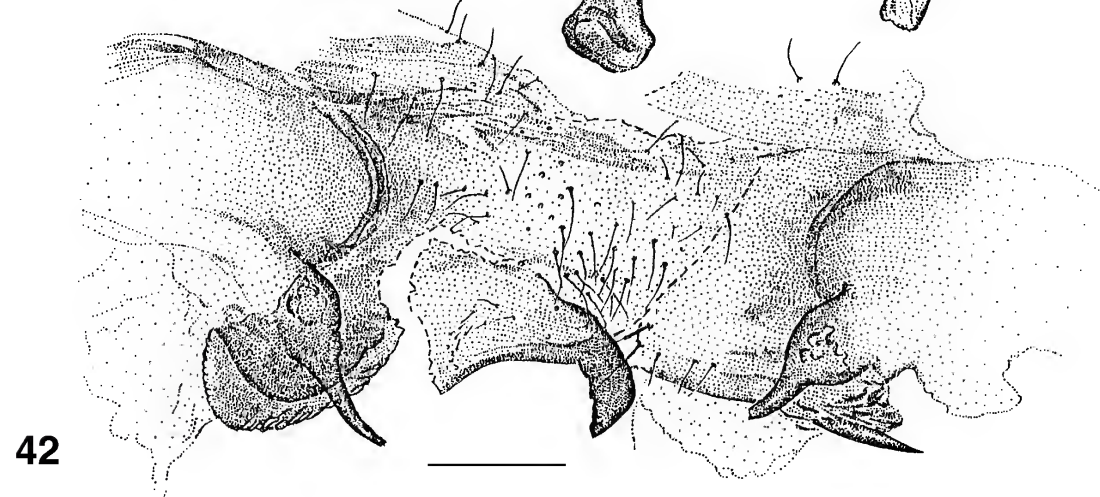
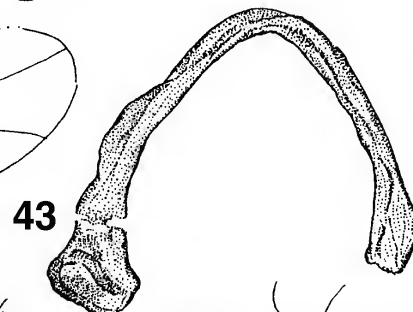
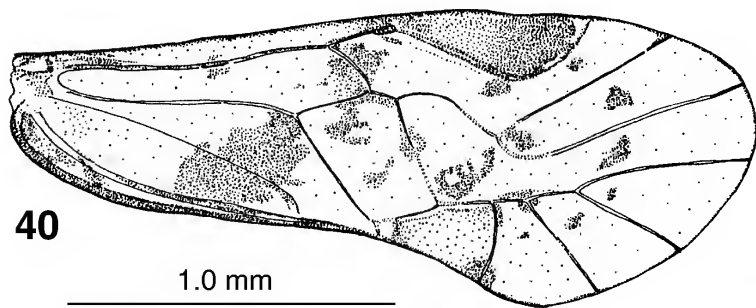


Figs. 34–39. *Trichadenotecnum kalibiruense* n.sp., ♂ holotype: (34) fore wing; (35) hind wing; (36) hypandrium; (37) phallosome; (38) epiproct; (39) paraproct. Figs. 36–39 to common scale.

spines and a row of four teeth medially. Moreover, the apical spine of the paraproct in *T. kalibiruense* is longer and more sharply curved than those of *T. masoni* and *T. bromoense*. *Trichadenotecnum bromoense* was referred to Yoshizawa's (2001) *spiniserrulum* group, and the basal paraproct process of the male of *T. kalibiruense* implies a similar position.

Trichadenotecnum cornutum n.sp.

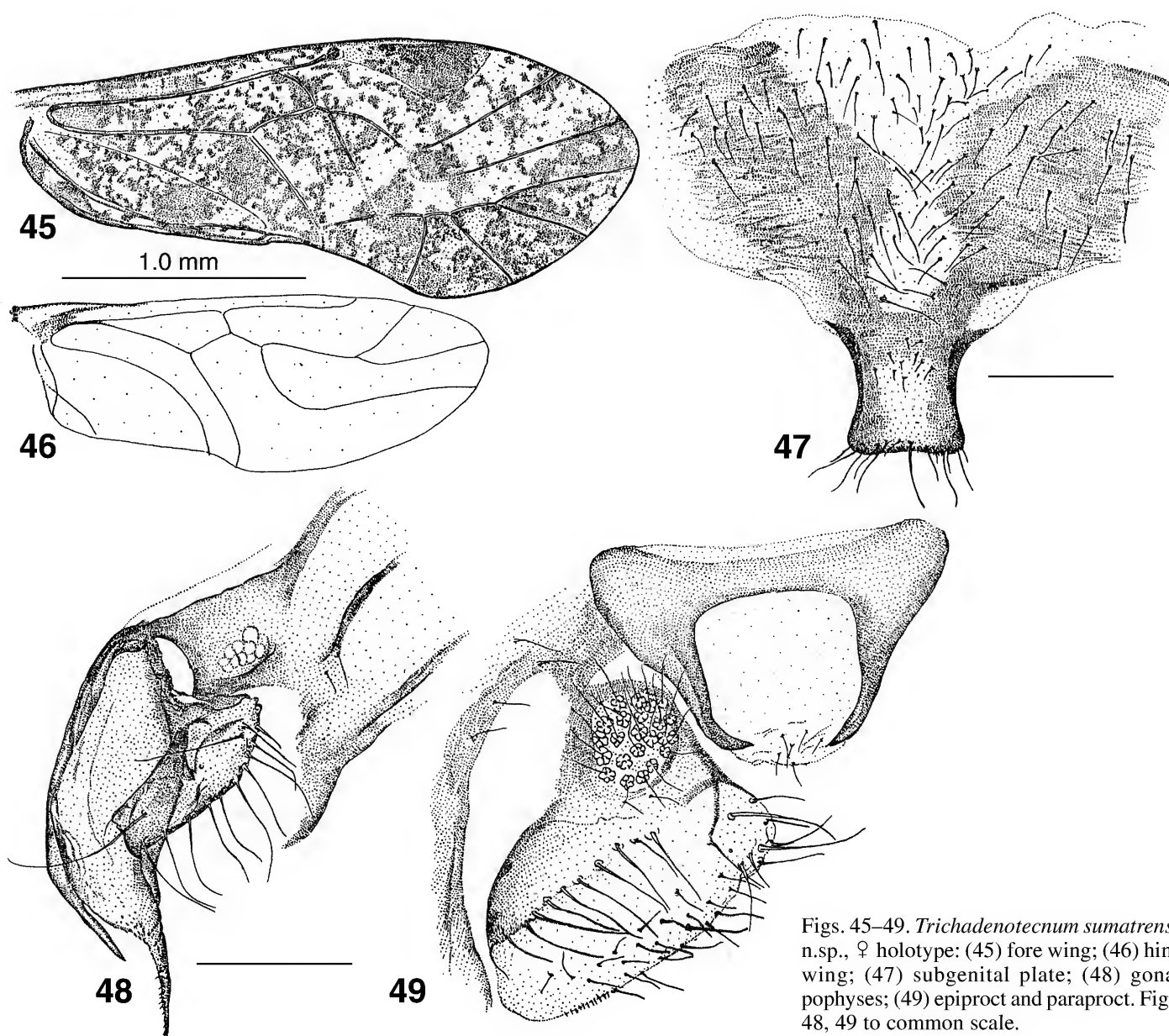
Figs. 40–44



Material examined. HOLOTYPE ♂, **Sumatra**: SE, Way Kambas National Park, Way Kanan, 5°04'S 105°42'E, mixed secondary forest, 20 m, 30.VI.1997, ESK (ZMB).

Female unknown.

Figs. 40–44. *Trichadenotecnum cornutum* n.sp., ♂ holotype: (40) fore wing; (41) hind wing; (42) hypandrium; (43) phallosome; (44) paraproct. Figs. 42–44 to common scale.



Figs. 45–49. *Trichadenotecnum sumatrense* n.sp., ♀ holotype: (45) fore wing; (46) hind wing; (47) subgenital plate; (48) gonapophyses; (49) epiproct and paraproct. Figs. 48, 49 to common scale.

Male

Colouration (c. 2 years in alcohol). Head pale, epicranial suture dark brown; uniform brown band each side extending to posterior margin of vertex, and mesial to each orbit. Eyes black. Ocelli pale, black centripetally. Frons with lateral dark brown mark contiguous with ventral margin of each eye. Antenna light brown. Gena dark brown anteriorly. Epistomal suture pale. Postclypeus with dark brown striation merging medially, pale lateral area. Labrum pale. Thorax pale with brown patches; pleura with transverse dark brown band ventrally. Fore wing with brown clouds as in Fig. 40. Hind wing (Fig. 41) suffused brown. Legs pale except apical band on femur, tibia and tarsal segments dark brown.

Morphology. IO:D 1.33. Fore wing venation as in Fig. 40. Hypandrium (Fig. 42, damaged) asymmetrical: two asymmetrical lateroapical projections, the left one a long spine and the right one serrated; anteriorly to the serrated projection a pair of symmetrical large spikes flanking curved tongue. Phallosome (Fig. 43) an open frame. Paraproct (Fig. 44) with field of about 11 trichobothria.

Dimensions. B 1.5; FW 1.35; HW 1.71; F 0.49; T 0.96; t_1 0.27; t_2 0.09; t_1/t_2 3; Ct 19 (t_1 2 (t_2); f_1 0.56; f_2 0.46; f_1/f_2 1.28.

Remarks. *Trichadenotecnum cornutum* has wing markings conforming to those of typical representatives of *Trichadenotecnum*. In general form of the hypandrium, this species differs from any previously described species. The open curved phallic frame of this species most closely resembles those of *T. apertum* Thornton from Hong Kong and *T. galihi* Endang *et al.* from East Java. The hypandria of *T. apertum* and *T. galihi*, however, lack a pair of subapical symmetrical spines.

Trichadenotecnum sumatrense n.sp.

Figs. 45–49

Material examined. HOLOTYPE ♀, **Sumatra**: North, Gunung Leuser National Park, Lawegurah, 3°38'N 97°40'E, mixed primary forest, beating, 325–360 m, 5.VI.1997, ESK (ZMB). PARATYPE ♀, **Sumatra**: SE, WKNP, Kiara Tunggal, 5°06'S 105°44'E, mixed secondary forest, 100 m, beating, 29.XII.1997, ESK (AMS K196202).

Male unknown.

Female

Colouration (c. 4 years in alcohol). Head ground colour yellowish. Epicranial suture dark brown, confluent brown patches each side reaching ocellar tubercle and extending to margin of vertex and mesial to each orbit. Eyes black. Ocelli pale black centripetally. Dark brown band from central ocellus toward anterior of each eye. Frons with median dark brown mark, two dark brown stripes lateral to this. Gena, epistomal suture, postclypeal striations, dorsal half of anteclypeus, labrum and maxillary palp dark brown. Thorax dark brown with small yellowish areas near lobes. Fore wing with dense dark brown markings as in Fig. 45. Hind wing (Fig. 46) suffused brown. Legs dark brown, pale between joints.

Morphology. IO:D 3.83. Fore wing venation as in Fig. 45. Subgenital plate (Fig. 47): apical lobe squarish, setose apically, median area close to main plate with field of very short setae; main plate with lateral oblong sclerotized area and field of long setae along midline of the plate and over sclerotized areas. Gonapophyses (Fig. 48): ventral valve

elongate, pointed apically; dorsal valve broad, with long apical spine; outer valve slender, with long setae, apically with broad short spine. Epiproct as in Fig. 49. Paraproct (Fig. 49) with row of very long stout setae and field of about 20 trichobothria.

Dimensions. B 1.8; FW 2.37; HW 1.82; F 0.47; T 0.82; t_1 0.3; t_2 0.12; t_1/t_2 2.5; Ct 19 (t_1) 2 (t_2); f_1 0.37; f_2 0.33; f_1/f_2 1.05.

Remarks. The subgenital plate of this species suggests relationship with *T. malayense* New (1975) (Malaysia) and *T. godavarensense* New (1971) (Nepal), *T. sufflatum* Li (1993) and *T. himalayense* Li & Yang (1987) (both from China, and both placed in *Trichadenopsocus* by Li, 2002). The fore wing pattern and female gonapophyses, however, differ markedly from these species.

Trichadenotecnum alobum n.sp.

Figs. 50–53

Material examined. HOLOTYPE ♀, Sumatra, Kerinci Seblat National Park, Gunung Tujuh, 1°43'S 101°13'E, 1600 m, mixed secondary forest, 23.I.1997, ESK (ZMB).

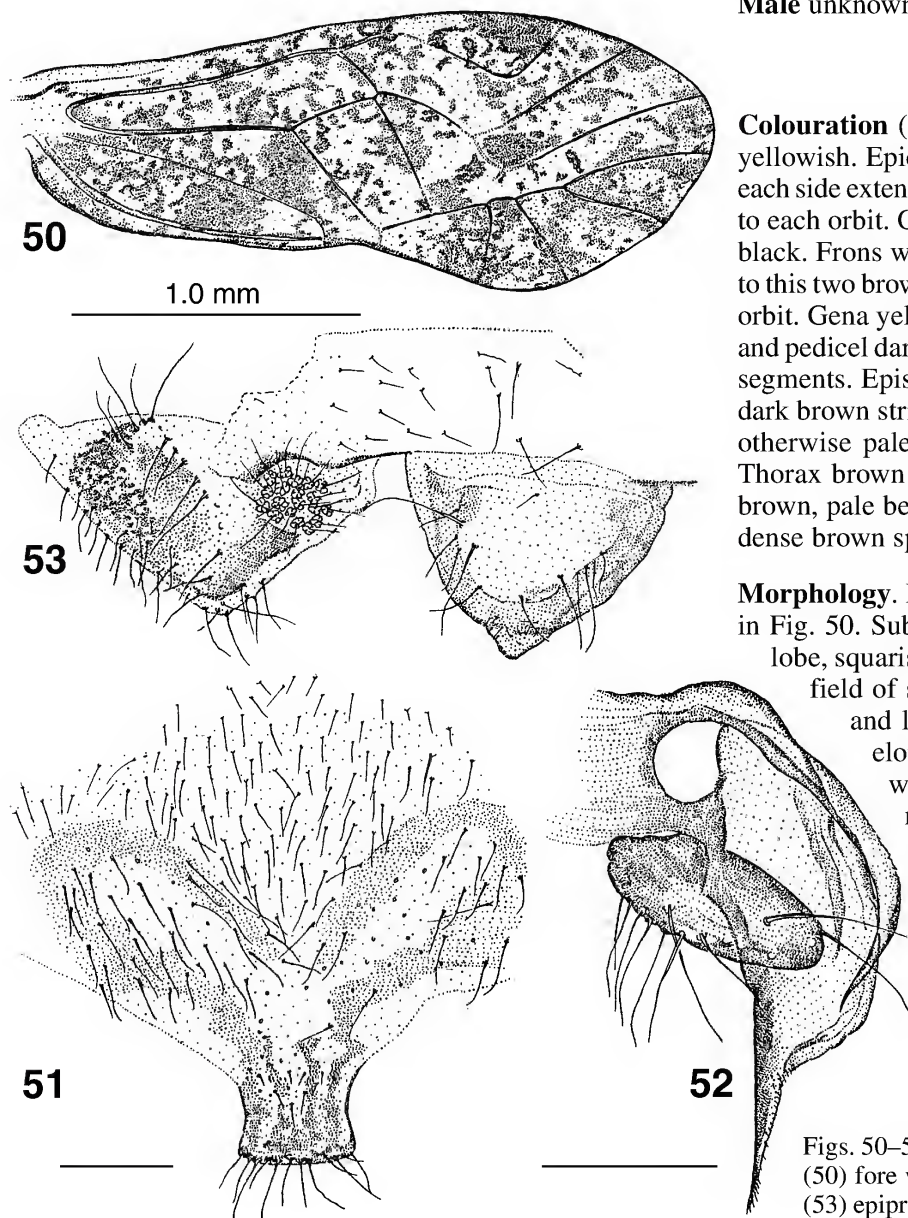
Male unknown.

Female

Colouration (c. 4 years in alcohol). Head ground colour yellowish. Epicranial suture light brown with brown spots each side extending to posterior margin of vertex, and mesial to each orbit. Ocelli pale, black centripetally. Eyes greyish black. Frons with median dark brown stirrup mark, lateral to this two brown bands from epistomal suture towards each orbit. Gena yellowish brown. Antenna brown except scape and pedicel dark brown, and pale between joints of flagellar segments. Epistomal suture light brown. Postclypeus with dark brown striations. Basal ¼ of anteclypeus dark brown, otherwise pale. Labrum and maxillary palp dark brown. Thorax brown with yellow patches on dorsal lobes. Legs brown, pale between joints. Fore wing (Fig. 50) with very dense brown spots. Hind wing (damaged) brown.

Morphology. IO:D 3.5, eyes small. Fore wing venation as in Fig. 50. Subgenital plate (Fig. 51) with short posterior lobe, squarish apically, bearing apical row of long setae, field of short setae on mid line between main plate and lobe. Gonapophyses (Fig. 52) ventral valve elongate, pointed apically, dorsal valve broad, with long acuminate apical spine, outer valve narrow, ovoid, lacking posterior lobe. Epiproct and paraproct as in Fig. 53.

Dimensions. B 1.98; FW 2.4; HW (damaged); F 0.43; T 0.92; t_1 0.28; t_2 0.1; t_1/t_2 2.8; Ct 16 (t_1) 2 (t_2) f_1 0.4; f_2 0.38; f_1/f_2 1.05.



Figs. 50–53. *Trichadenotecnum alobum* n.sp., ♀ holotype: (50) fore wing; (51) subgenital plate; (52) gonapophyses; (53) epiproct and paraproct. Figs. 51, 53 to common scale.

Remarks. In genitalic features *T. alobum* most closely resembles *T. godavarens* New from Nepal, in having an ovoid outer gonapophysis valve and a broad dorsal valve with a long acuminate apical spine. The ventral valve of *T. godavarens*, however, is decidedly the shorter. The subgenital plates of both species have short squarish apical lobes with a row of long setae along the apical margin, but the main plates differ, the deeply bifurcate sclerotized region of *T. godavarens* being distinctive. The absence of a posterior lobe to the outer gonapophysis valve was regarded by Yoshizawa (2001) as an apomorphy for the *spiniserrulum* group but *T. alobum* also has a long ventral valve, unlike typical members of that group.

***Trichadenotecnum muaraense* n.sp.**

Figs. 54–60

Material examined. HOLOTYPE ♂, **Sumatra:** West, Kerinci Seblat National Park, Muara Emat, 2°03'S 101°42'E, mixed secondary forest with remnants of cultivated trees and shrubs, 240 m, 18.I.1997, ESK (ZMB).

Female unknown.

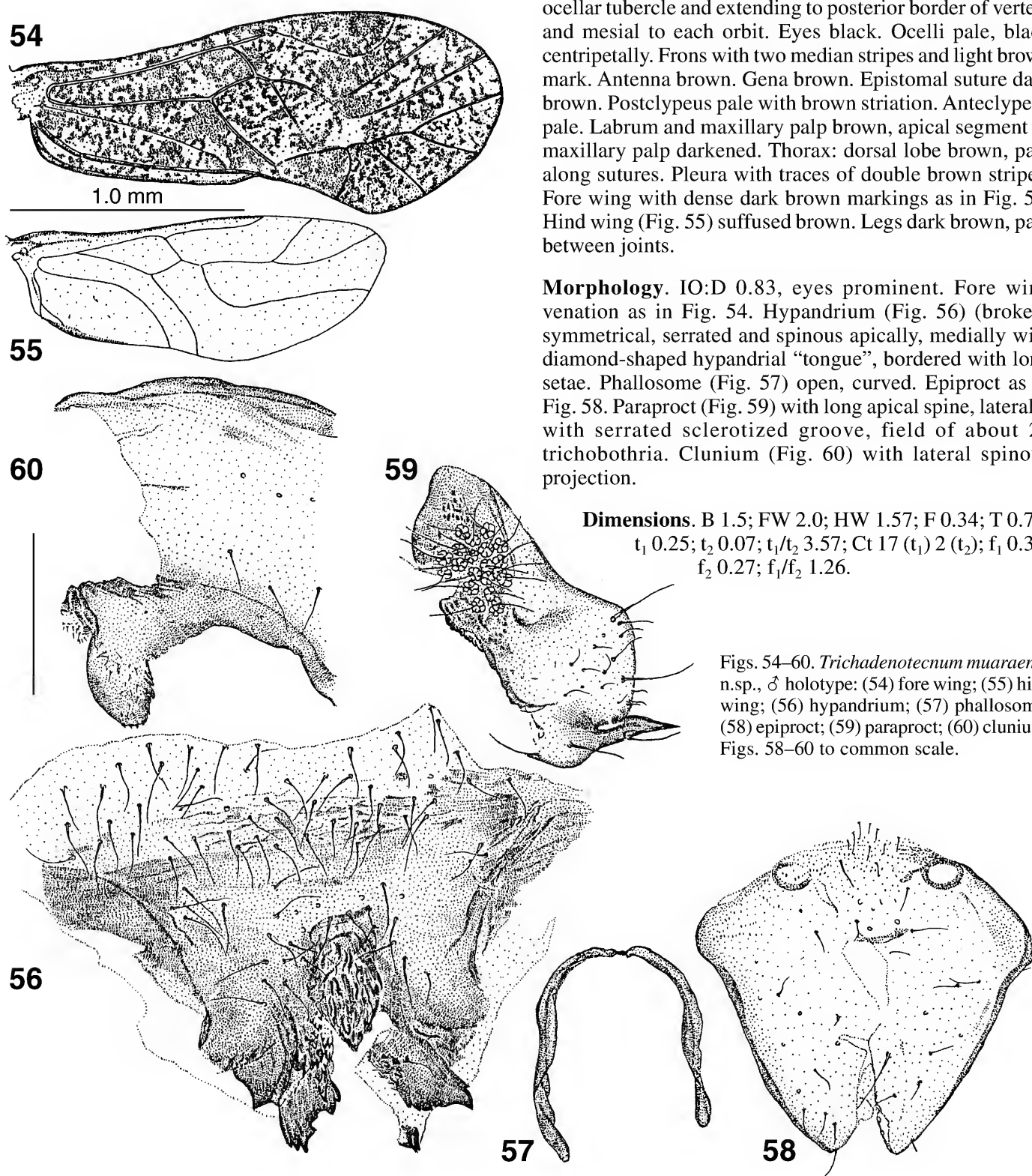
Male

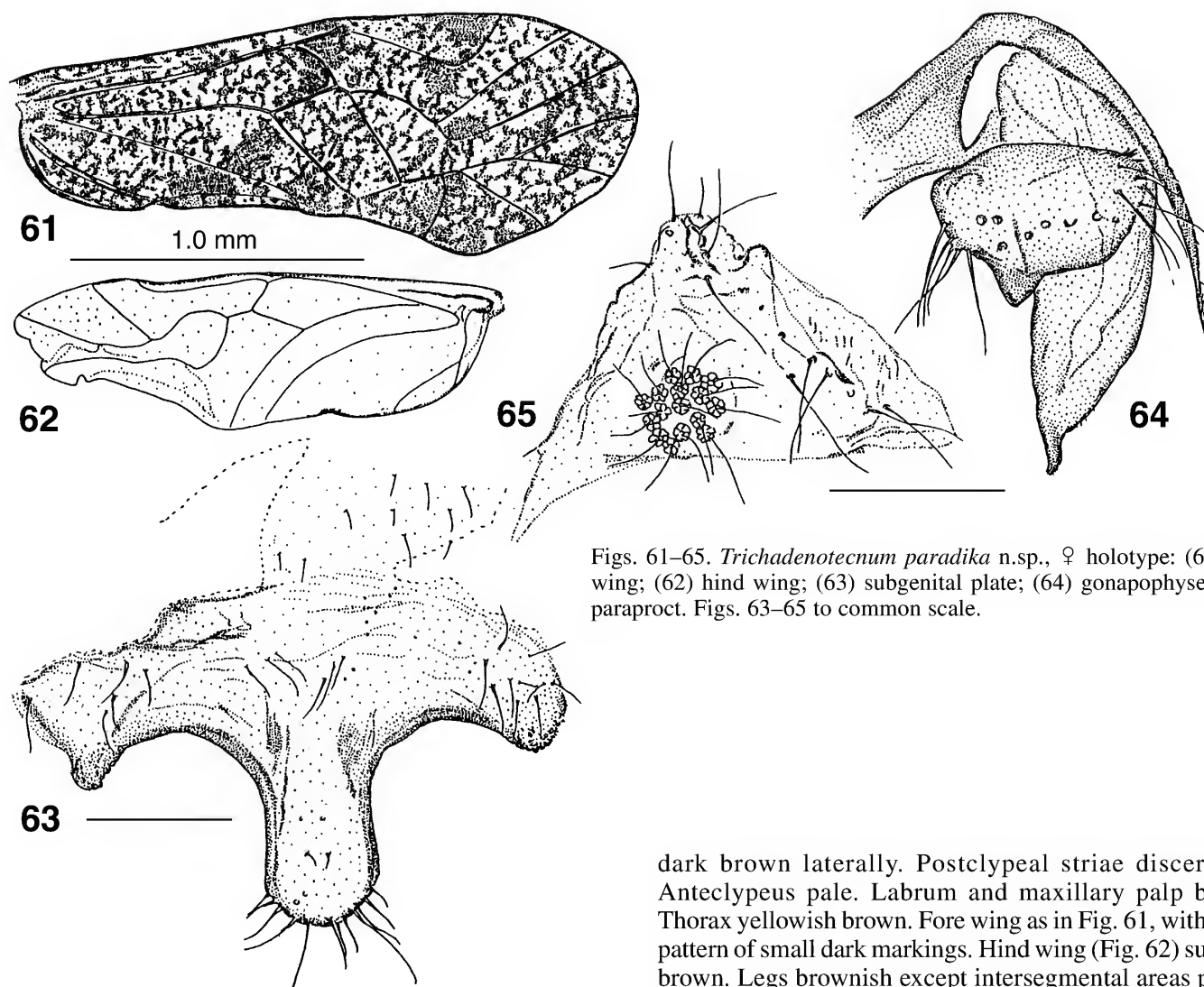
Colouration (c. 4 years in alcohol). Head pale. Epicranial suture dark brown, light brown patches each side reaching ocellar tubercle and extending to posterior border of vertex, and mesial to each orbit. Eyes black. Ocelli pale, black centripetally. Frons with two median stripes and light brown mark. Antenna brown. Gena brown. Epistomal suture dark brown. Postclypeus pale with brown striation. Anteclypeus pale. Labrum and maxillary palp brown, apical segment of maxillary palp darkened. Thorax: dorsal lobe brown, pale along sutures. Pleura with traces of double brown stripes. Fore wing with dense dark brown markings as in Fig. 54. Hind wing (Fig. 55) suffused brown. Legs dark brown, pale between joints.

Morphology. IO:D 0.83, eyes prominent. Fore wing venation as in Fig. 54. Hypandrium (Fig. 56) (broken) symmetrical, serrated and spinous apically, medially with diamond-shaped hypandrial “tongue”, bordered with long setae. Phallosome (Fig. 57) open, curved. Epiproct as in Fig. 58. Paraproct (Fig. 59) with long apical spine, laterally with serrated sclerotized groove, field of about 23 trichobothria. Clunium (Fig. 60) with lateral spinous projection.

Dimensions. B 1.5; FW 2.0; HW 1.57; F 0.34; T 0.73; t_1 0.25; t_2 0.07; t_1/t_2 3.57; Ct 17 (t_1) 2 (t_2); f_1 0.34; f_2 0.27; f_1/f_2 1.26.

Figs. 54–60. *Trichadenotecnum muaraense* n.sp., ♂ holotype: (54) fore wing; (55) hind wing; (56) hypandrium; (57) phallosome; (58) epiproct; (59) paraproct; (60) clunium. Figs. 58–60 to common scale.





Figs. 61–65. *Trichadenotecnum paradika* n.sp., ♀ holotype: (61) fore wing; (62) hind wing; (63) subgenital plate; (64) gonapophyses; (65) paraproct. Figs. 63–65 to common scale.

Remarks. The wing pattern of this species most resembles that of *T. dolabratum* Li & Yang, 1987 (China; placed in *Loensia* by Li, 2002), but the genitalia differ markedly. The median hypandrial tongue of *T. dolabratum* is surrounded by long setae, that are absent in the Sumatran specimen. The phallosome of *T. dolabratum* is a closed frame with a long pointed posterior projection, whereas that of *T. muaraense* is an open frame. Moreover, features of the epiproct and paraproct differ.

***Trichadenotecnum paradika* n.sp.**

Figs. 61–65

Material examined. HOLOTYPE ♀, Sumatra: SE, Pematang, 3°50'S 105°01'E, 40 m, rubber plantation, 13.I.1996, ESK (ZMB).

Male unknown.

Female

Colouration (c. 4 years in alcohol). Head yellowish brown. Epicranial suture light brown. Light brown patches each side of epicranial suture and mesial to each orbit extend to posterior margin of vertex and mesial to each orbit. Ocelli pale black centripetally. Eyes black. Frons with median dark brown V-shaped mark, lateral to this a dark brown band curved towards each orbit. Antennal socket bordered with dark brown. Antennae pale. Epistomal suture pale medially,

dark brown laterally. Postclypeal striae discernible. Anteclypeus pale. Labrum and maxillary palp brown. Thorax yellowish brown. Fore wing as in Fig. 61, with dense pattern of small dark markings. Hind wing (Fig. 62) suffused brown. Legs brownish except intersegmental areas pale.

Morphology. IO:D 1.25. Fore wing venation as in Fig. 61. Subgenital plate (Fig. 63) posterior lobe long, with rounded apex with long and short setae; main plate with postero-lateral corrugated projection each side and scattered long setae anteriorly. Gonapophyses (Fig. 64): ventral valve elongate and pointed apically; dorsal valve broad with short apical spine; outer valve broad, short, with small conical posterior lobe, and long stout setae; a small group of very short setae near apex of valve anteriorly. Epiproct missing. Paraproct (Fig. 65) with field of about 16 trichobothria.

Dimensions. B 1.98; FW 2.22; HW 1.83; F 0.4; T 0.84; t_1 0.23; t_2 0.07; t_1/t_2 3.28; Ct 15 (t_1) 2 (t_2); f_1 0.38; f_2 0.33; f_1/f_2 1.15.

Remarks. This single specimen differs from previously described species in the form of the subgenital plate. This resembles those of *T. laticornutum* Endang *et al.*, *T. adika* Endang *et al.* and *T. waykananense* n.sp. in having a lateral corrugated projection each side on the posterior margin, but the projection of *T. paradika* is shorter than in those three species. The fore wing pattern of *T. laticornutum* conforms to that typical of typical representatives of *Trichadenotecnum*. In fore wing pattern and some features of the gonapophyses *T. paradika* most closely resembles *T. adika*. In *T. adika* the dorsal gonapophysis valve has a long setose apical spine whereas in *T. paradika* it is short and has fewer setae. On the form of the subgenital plate, these species may constitute a distinct species group.

Trichadenotecnum proctum n.sp.

Figs. 66–71

Material examined. HOLOTYPE ♂, **Sumatra:** West, Batu Ampar, 2°00'S 101°25'E, tea plantation, 1360 m, 21.I.1997, ESK (ZMB).

Female unknown.

Male

Colouration (c. 4 years in alcohol). Head ground colour whitish. Epicranial suture light brown, confluent brown patches each side across posterior border of vertex, and mesial to each orbit. Eyes black. Ocelli pale with black crescent mark between them. Frons unmarked. Gena dark brown ventrally. Antenna light brown except scape and pedicel dark brown. Epistomal suture pale medially and brown laterally. Postclypeus with brown striation. Basal quarter of anteclypeus dark brown, otherwise pale. Labrum and maxillary palp dark brown; intersegmental area of maxillary palp pale. Thorax whitish, dark brown along sutures. Fore wing with dense pattern of small dark brown markings as in Fig. 66. Hind wing (Fig. 67) suffused brown. Legs light brown except coxa, trochanter and second tarsal segment dark brown.

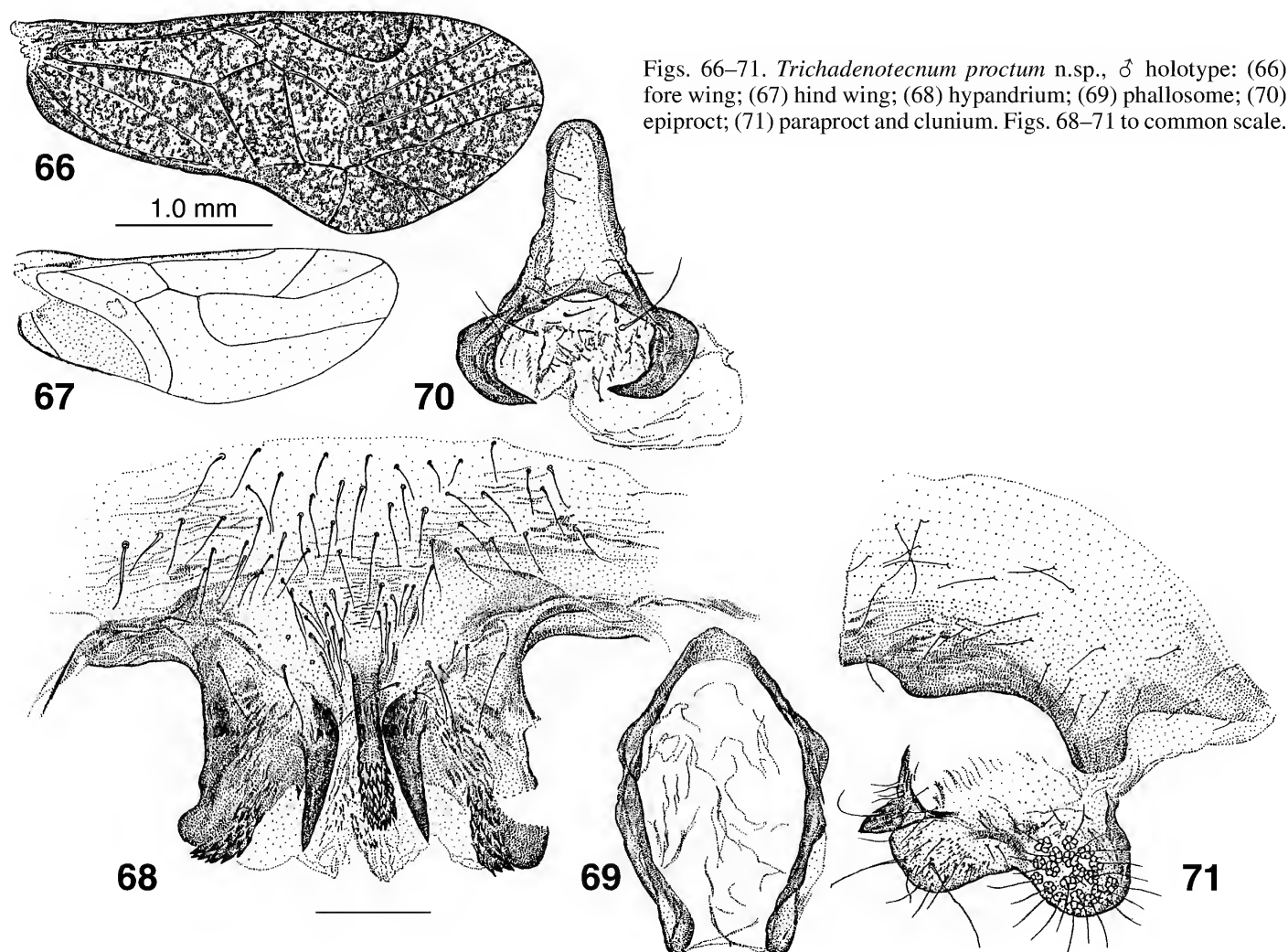
Morphology. IO:D 2.22. Fore wing venation as in Fig. 66. Hypandrium (Fig. 68) symmetrical: lateroapical spinous projection each side, medially to this each side a stout long

spine; tongue slender, spinous distally; two groups of long setae each side of mid-line and scattered long setae on basal area. Phallosome (Fig. 69) “wishbone”-shaped. Epiproct (Fig. 70) with broad lateroapical sclerotized area and long cone-shaped distal lobe. Paraproct (Fig. 71) with broad apical spine and field of about 21 trichobothria.

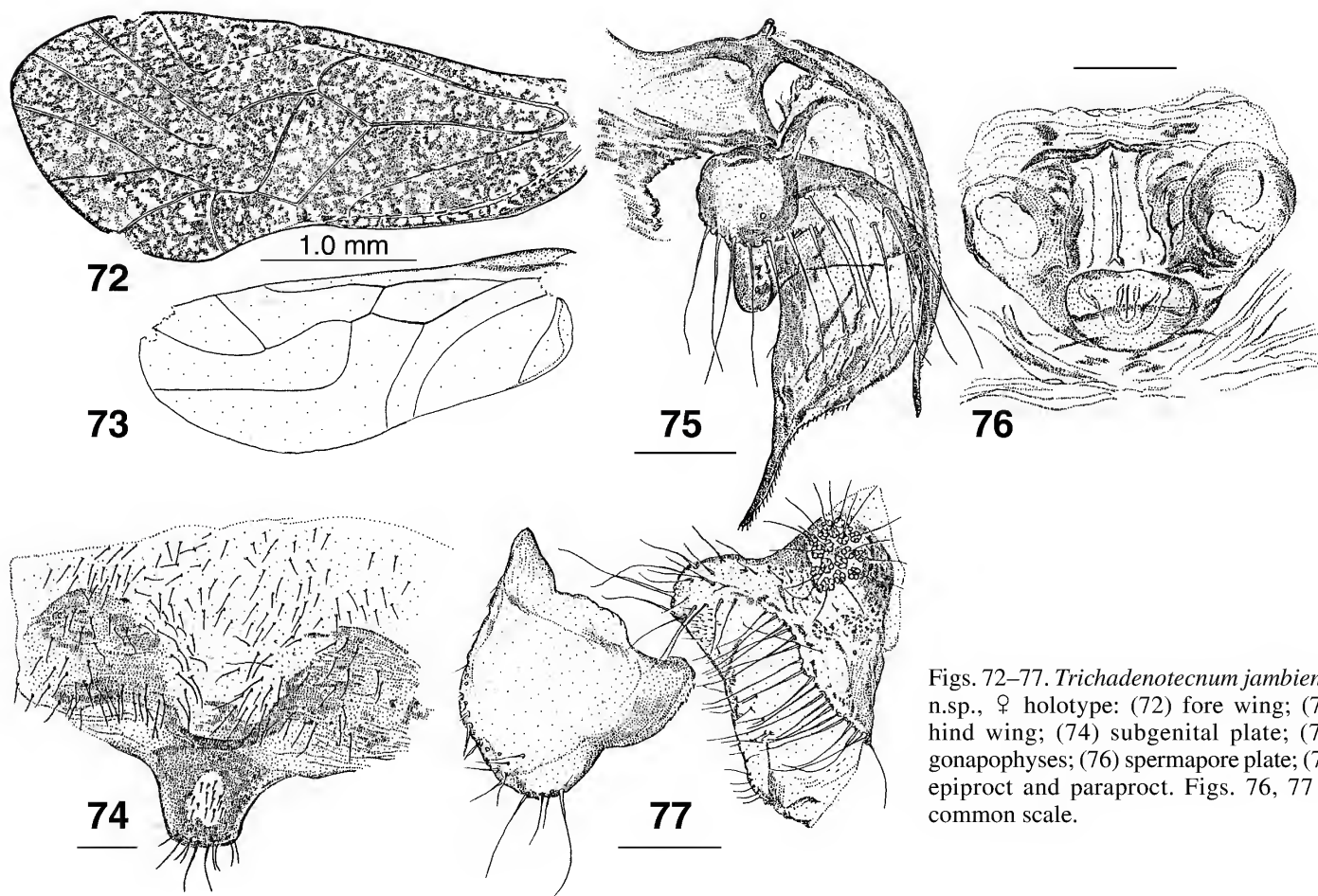
Dimensions. B 2.6; FW 3.3; HW 2.4; F 0.54; T 1.09; t_1 0.33; t_2 0.1; t_1/t_2 3.3; Ct 18 (t_1 2 (t_2); f_1 0, 63; f_2 0.7; f_1/f_2 0.9

Remarks. Endang *et al.* (2002) described *Trichadenotecnum vauhani* from West Java (1560 m). In fore wing markings and venation, and in the form of the hypandrium, *T. vauhani* agrees with typical representatives of *Trichadenotecnum* (see Thornton, 1961). Endang *et al.* (2002) noted that the general form of its hypandrium resembles that of *T. thorntoni* New, 1975 from Kenya, but the wing pattern of the latter is of *Loensia*-type. The present Sumatran species shows a mosaic of the features of the above two species. The fore wing pattern and hypandrium most resemble *T. vauhani* (asymmetrical with median oblong tongue), differing from it only in small details. The epiproct of *T. vauhani* is pentagonal, whereas that of *T. proctum* is of a quite distinctive shape.

The fore wing of this individual suggests relationship with the following species, known only from the female, and it is possible that they may prove to be conspecific once more material is available for study.



Figs. 66–71. *Trichadenotecnum proctum* n.sp., ♂ holotype: (66) fore wing; (67) hind wing; (68) hypandrium; (69) phallosome; (70) epiproct; (71) paraproct and clunium. Figs. 68–71 to common scale.



Figs. 72–77. *Trichadenotecnum jambiense* n.sp., ♀ holotype: (72) fore wing; (73) hind wing; (74) subgenital plate; (75) gonapophyses; (76) spermapore plate; (77) epiproct and paraproct. Figs. 76, 77 to common scale.

***Trichadenotecnum jambiense* n.sp.**

Figs. 72–77

Material examined. HOLOTYPE ♀, **Sumatra:** West, Jambi, Leter W, 1°12'S 101°10'E, citrus, 1320 m, 19.VI.1997, ESK (ZMB).

Male unknown.

Female

Colouration (after about 4 years in alcohol). Head ground colour buff. Epicranial suture pale. Confluent brown patches each side of epicranial suture across posterior margin of vertex, and mesial to each orbit. Eyes black. Ocelli pale, black centripetally. Frons with median light brown mark. Antenna pale except scape and pedicel dark brown. Gena with dark brown patch. Epistomal suture light brown. Postclypeus buff with brown striations, darkened ventrally. Dorsal and ventral of anteclypeus brown, basally and distally, otherwise medially pale. Labrum and maxillary palp dark brown; intersegmental regions of maxillary palp pale. Thorax: dorsal lobes of mesothorax buff and of metathorax brown; thoracic pleura buff with brown patches. Fore wing (Fig. 72) with dense pattern of small dark brown markings. Hind wing (Fig. 73) suffused brown. Legs, coxa and second tarsal segment dark brown, otherwise light brown.

Morphology. IO:D 2.5. Fore wing venation as in Fig. 72. Subgenital plate (Fig. 74): short trapezoidal posterior lobe with long setae apically; field of moderately long setae about midline of lobe; main plate with lateral sclerotized areas and median dark sclerotized transverse bar. Gonapophyses (Fig. 75) ventral valve elongate, pointed apically; dorsal

valve broad with long acuminate apical spine; outer valve with long setae and short posterior lobe. Spermapore plate heavily ornamented, as in Fig. 76. Epiproct (Fig. 77) with long apical setae. Paraproct (Fig. 77) with field of about 18 trichobothria.

Dimensions. B 2.5; FW 3.4; HW 2.6; F 0.69; T 1.37; t_1 0.1; t_2 0.33; t_1/t_2 3.3; Ct 19 (t_1) 3 (t_2); f_1 0.8; f_2 0.6; f_1/f_2 1.33.

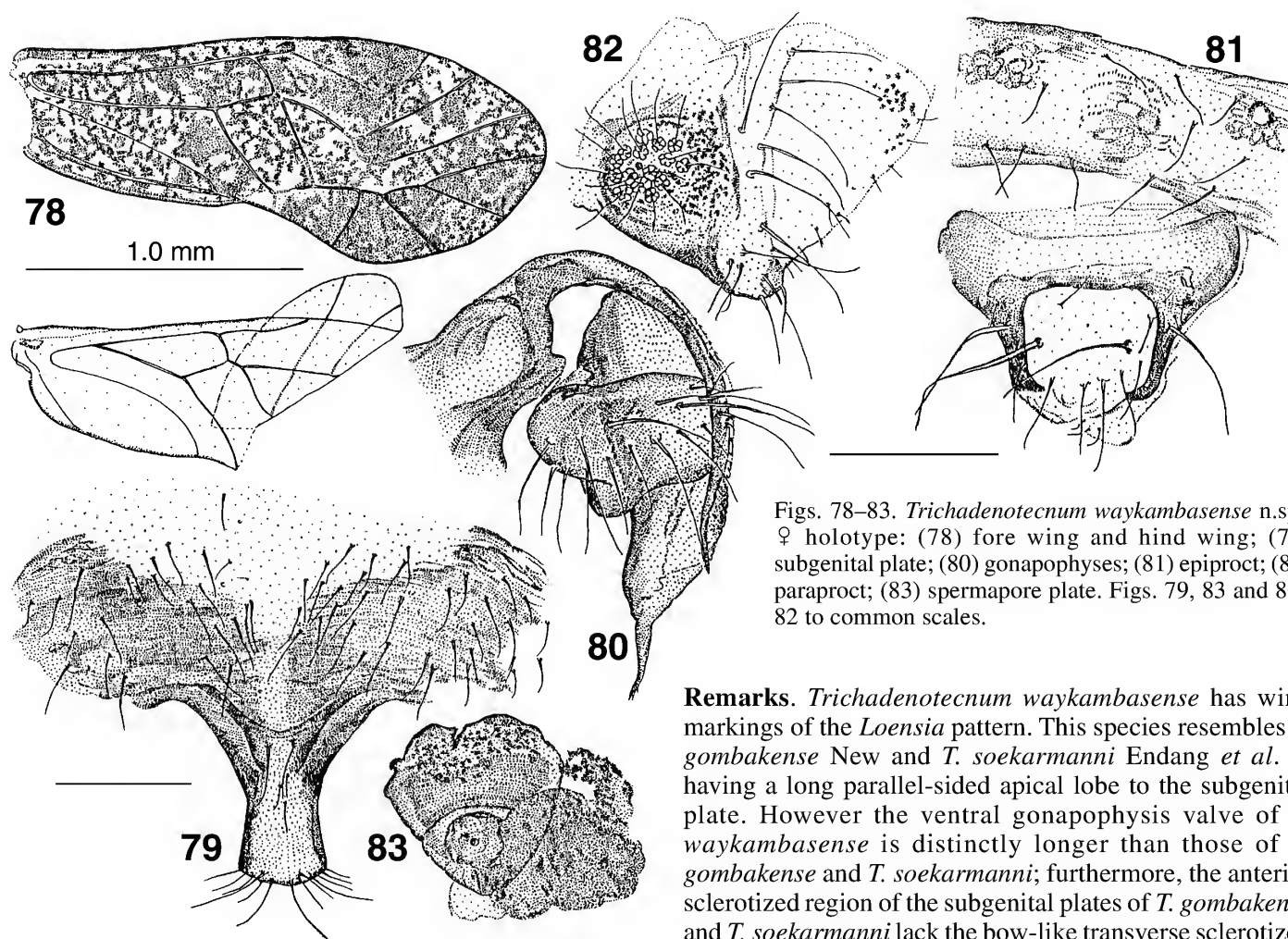
Remarks. *Trichadenotecnum jambiense* has a *Loensia*-type fore wing pattern. In genitalic features, it resembles *T. medium* Thornton from Hong Kong, in that the subgenital plate has a short posterior lobe and a transverse sclerotized bar on the main plate. The dorsal valve of the gonapophyses, however, is broader in *T. jambiense* than in *T. medium*. *Trichadenotecnum jambiense* is also similar to *T. taenianum* Li & Yang from China (placed in *Loensia* by Li, 1999, 2002) in having a short posterior lobe to the subgenital plate, but the subgenital plate of the latter lacks the transverse median sclerotized bar on the main plate and the ventral gonapophysis valve is shorter than that of *T. jambiense*. See comment under *T. proctum*, above.

***Trichadenotecnum waykambasense* n.sp.**

Figs. 78–83

Material examined. HOLOTYPE ♀, **Sumatra:** SE, Way Kambas National Park, Way Kanan, 5°04'S 105°42'E, mixed secondary forest, 20 m, 30.VI.1997, ESK (ZMB). PARATYPE ♀, same data as holotype (AMS K196203).

Male unknown.



Figs. 78–83. *Trichadenotecnum waykambasense* n.sp., ♀ holotype: (78) fore wing and hind wing; (79) subgenital plate; (80) gonapophyses; (81) epiproct; (82) paraproct; (83) spermapore plate. Figs. 79, 83 and 80–82 to common scales.

Female

Colouration (c. 4 years in alcohol). Head ground colour buff. Epicranial suture dark brown; confluent brown patches each side extending to posterior margin of vertex, and mesial to each orbit. Eyes black. Ocelli pale, black centripetally. A narrow dark brown stripe from median ocellus toward each antennal socket. Antennal socket bordered with dark brown band. Antenna dark brown, pale between joints. Gena with brown markings. Frons with median brown V-shaped mark and dark brown stripe laterally. Postclypeus buff with dark brown striations darkened distally. Anteclypeus dark brown on basal quarter, otherwise pale. Labrum and maxillary palp dark brown. Thorax dark brown, buff along sutures. Fore wing with dense dark brown markings as in Fig. 78. Legs dark brown, pale between joints.

Morphology. IO:D 3. Wing venation as in Fig. 78. Subgenital plate (Fig. 79) posterior lobe long, somewhat rounded apically, with long setae along apical margin; two long setae near base of the lobe; anterior to these a narrow sclerotized bar connecting the lateral sclerotized areas on disc. Gonapophyses (Fig. 80) ventral valve long, with acuminate apical spine; dorsal valve with long pointed apex; outer valve with short posterior lobe. Epiproct (Fig. 81). Paraproct (Fig. 82) with field of about 18 trichobothria. Spermapore plate sclerotized (Fig. 83).

Dimensions. B 1.56; FW 1.9; HW 1.62; F 0.34; T 0.62; t_1 0.2; t_2 0.09; t_1/t_2 2.22; Ct 16 (t_1) 2 (t_2); f_1 0.3; f_2 0.25; f_1/f_2 1.2.

Remarks. *Trichadenotecnum waykambasense* has wing markings of the *Loensia* pattern. This species resembles *T. gombakense* New and *T. soekarmanni* Endang *et al.* in having a long parallel-sided apical lobe to the subgenital plate. However the ventral gonapophysis valve of *T. waykambasense* is distinctly longer than those of *T. gombakense* and *T. soekarmanni*; furthermore, the anterior sclerotized region of the subgenital plates of *T. gombakense* and *T. soekarmanni* lack the bow-like transverse sclerotized bar. *Trichadenotecnum soekarmanni* was attributed to Yoshizawa's (2001) *spiniserrulum* group (Endang *et al.*, 2002), but the long ventral gonapophysis valve of *T. waykambasense* suggests that the two species may be related only more distantly.

Trichadenotecnum cinnamonum n.sp.

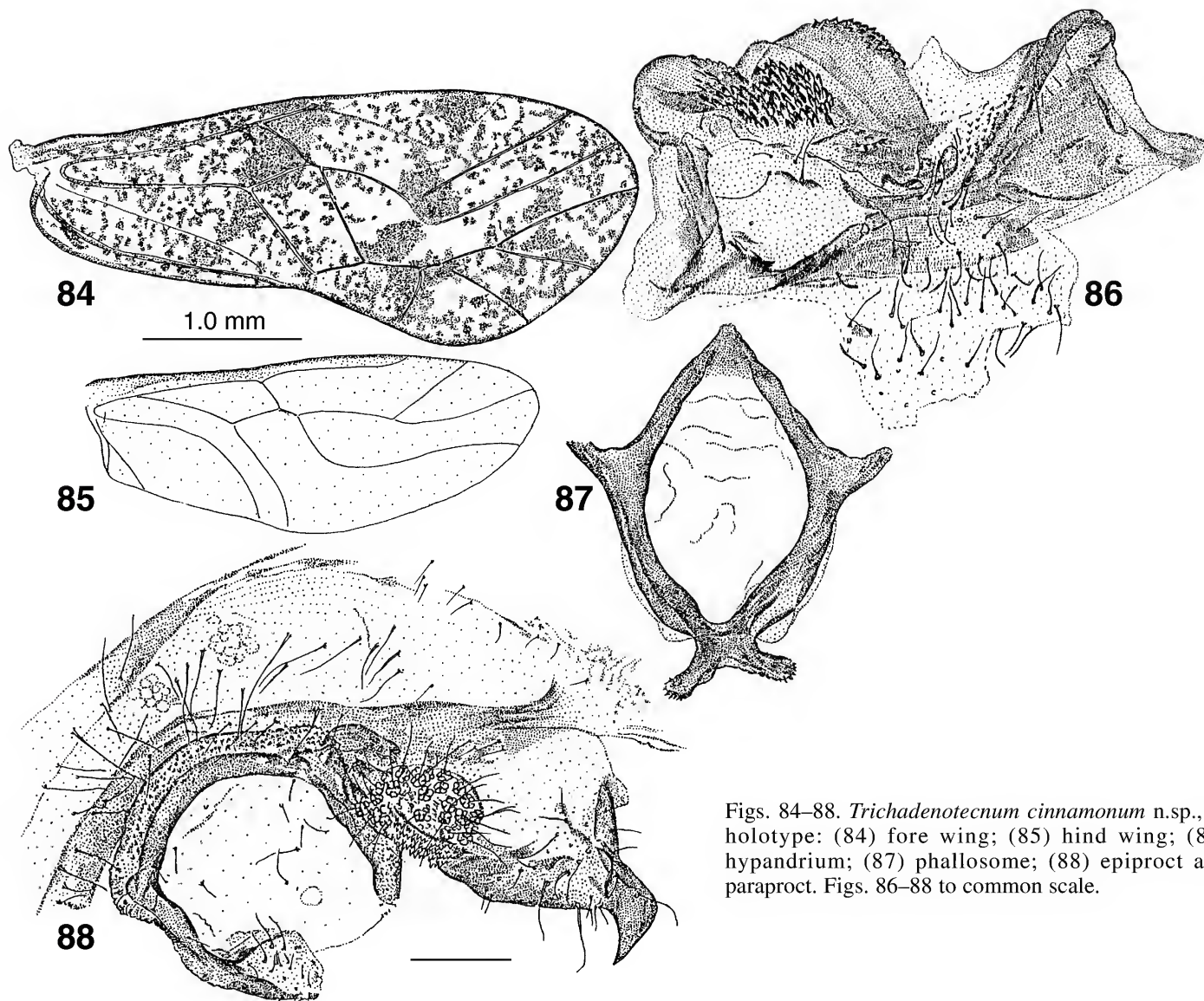
Figs. 84–93

Material examined. HOLOTYPE ♂, Sumatra: West, Kerinci Seblat National Park, East slope of Mt Kerinci, 1°40'S 101°13'E, cinnamon, 1700 m, 20.VI.1997, ESK (ZMB). PARATYPE ♀, same data as holotype (ZMB).

Male

Colouration (c. 4 years in alcohol). Head ground colour buff with the following dark brown: epicranial suture; mark each side of epicranial suture to posterior margin of vertex, and mesial to each orbit; median V-shaped mark on frons, border of antennal socket; epistomal suture; postclypeal striations; basal ¼ of anteclypeus; labrum; maxillary palp. Eyes greyish black. Ocelli pale black centripetally. Antenna light brown, scape and pedicel dark brown and pale between joints. Thorax: dorsal lobes dark brown, buff along sutures; lateral lobes buff dorsally, dark brown ventrally. Fore wing as in Fig. 84, with pattern of scattered small dark brown markings. Hind wing (Fig. 85) suffused brown. Legs dark brown, pale between joints.

Morphology. IO:D 1.0. Wing venation as in Figs. 84, 85. Hypandrium (Fig. 86) asymmetrical: large lateroapical



Figs. 84–88. *Trichadenotecnum cinnamonum* n.sp., ♂ holotype: (84) fore wing; (85) hind wing; (86) hypandrium; (87) phallosome; (88) epiproct and paraproct. Figs. 86–88 to common scale.

spinous lobe on one side; scattered long setae on the midline; field of small spines in subapical region. Phallosome (Fig. 87) a closed frame with bifid rugose distal projection. Epiproct (Fig. 88) with strong lateral prongs and basal corrugated bow-like area. Paraproct (Fig. 88) with broad apical spine, a field of small spines contiguous with field of about 26 trichobothria.

Dimensions. B 2.9; FW 3.65; HW 2.8; F 0.6; T 1.39; t_1 0.42; t_2 0.13; t_1/t_2 3.23; Ct 15 (t_1) 2 (t_2); f_1 0.75; f_2 0.69; f_1/f_2 1.08.

Female

Colouration (c. 4 years in alcohol). As male except whole pleura dark brown, buff along sutures; lateral to eye V-shaped mark on frons as two narrow stripes and narrow brown band from median ocellus toward ventral region of eyes. Fore wing as in Fig. 89. Hind wing as in Fig. 90.

Morphology. IO:D 2.2. Fore wing venation as in Fig. 89. Subgenital plate (Fig. 91): posterior lobe blunt apically with apical row of long setae and field of short setae around midline of lobe; main plate with broad lateral sclerotization. Gonapophyses (Fig. 92): ventral valve elongate, pointed apically; dorsal valve with long apical acuminate point; outer

valve with fine teeth on outer margin of posterior lobe. Epiproct (Fig. 93). Paraproct (Fig. 93) with field of about 24 trichobothria.

Dimensions. B 2.5; FW 3.53; HW 2.67; F 0.65; T 1.25; t_1 0.32; t_2 0.14; t_1/t_2 2.28; Ct 19 (t_1) 3 (t_2); f_1 0.57; f_2 0.55; f_1/f_2 1.04.

Remarks. *Trichadenotecnum cinnamonum* has a *Loensia*-type wing pattern. The phallosome resembles that of *T. godavarensense* New from Nepal in having a bifid apical tine, but the phallosome of *T. godavarensense* lacks the lateral prongs. Furthermore, *T. godavarensense* has a bifid hypandrial tongue, absent in *T. cinnamonum*. In *T. cinnamonum* the epiproct has a basal corrugated bow-like area on the epiproct and a field of spines contiguous to the paraproct trichobothrial field, whereas in *T. godavarensense* these characters are absent. In general, the subgenital plate is similar to that of *T. godavarensense*, but differs slightly in that the anterior sclerotized area of *T. godavarensense* has two pigmented connections between stems of the anterolateral sclerotized area and the sclerotized area of the apical lobe, whereas in *T. cinnamonum* these are absent. The ventral valve of *T. godavarensense* is also somewhat shorter than that of *T. cinnamonum*.

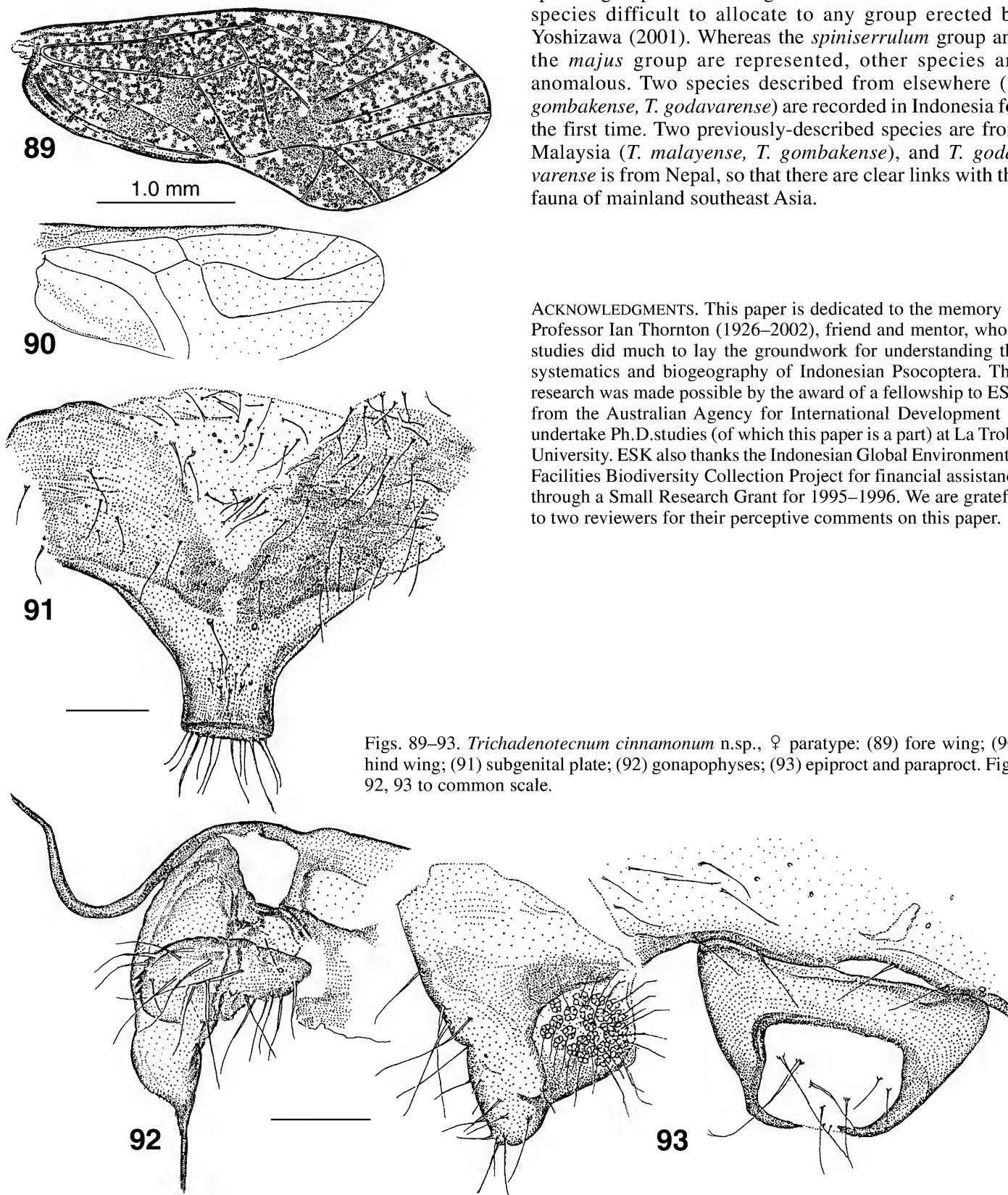
Discussion

Numerous species of *Trichadenotecnum* occur in Indonesia, and many are apparently scarce and have been taken in only small numbers. Many of them appear to be endemic taxa, and it is certain that further species await discovery. Both “true *Trichadenotecnum*” and putative *Loensia*-like taxa are well-represented in the region. Several of the latter appear similar to one or more of the numerous Chinese species but

are distinct on details of terminalia and wing pattern from all species depicted by Li (2002). However, with the considerable diversity of *Trichadenotecnum*-like taxa now known from China, Japan and Indonesia, it is increasingly evident that the complex has proliferated considerably in the eastern Palaearctic and tropical southeast Asia.

Detailed biogeographical comment is perhaps premature, with further collecting of these relatively scarce psocids needed before any major synthesis can be made. Likewise, division of the Indonesian representatives of the genus into species groups is not straightforward with a number of species difficult to allocate to any group erected by Yoshizawa (2001). Whereas the *spiniserrulum* group and the *majus* group are represented, other species are anomalous. Two species described from elsewhere (*T. gombakense*, *T. godavarensense*) are recorded in Indonesia for the first time. Two previously-described species are from Malaysia (*T. malayense*, *T. gombakense*), and *T. godavarensense* is from Nepal, so that there are clear links with the fauna of mainland southeast Asia.

ACKNOWLEDGMENTS. This paper is dedicated to the memory of Professor Ian Thornton (1926–2002), friend and mentor, whose studies did much to lay the groundwork for understanding the systematics and biogeography of Indonesian Psocoptera. This research was made possible by the award of a fellowship to ESK from the Australian Agency for International Development to undertake Ph.D. studies (of which this paper is a part) at La Trobe University. ESK also thanks the Indonesian Global Environmental Facilities Biodiversity Collection Project for financial assistance through a Small Research Grant for 1995–1996. We are grateful to two reviewers for their perceptive comments on this paper.



Figs. 89–93. *Trichadenotecnum cinnamonum* n.sp., ♀ paratype: (89) fore wing; (90) hind wing; (91) subgenital plate; (92) gonapophyses; (93) epiproct and paraproct. Figs. 92, 93 to common scale.

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Exogoninae (Polychaeta: Syllidae) from Australia With the Description of a New Genus and Twenty-two New Species

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ABSTRACT. Large collections of Syllidae (Polychaeta) from around Australia, which were deposited at the Australian Museum (Sydney), and at Museum Victoria as well as some specimens from Tasmania, have been examined and identified. Additionally material from the Hamburgische Zoologische Museum der Universität, Hamburg, Germany was examined. All known Australian species of the subfamily Exogoninae (Syllidae) are described and figured. Some were examined using the Scanning Electron Microscope to illustrate some characters and methods of reproduction in this subfamily. Keys to genera and species are given. A total of 74 species are reported from Australia belonging to 8 genera: *Nooralia* San Martín, 2002 (1 species); *Salvatoria* McIntosh, 1885 (7 species); *Prosphaerosyllis* San Martín, 1984 (10 species); *Erinaceusyllis* n.gen. (10 species); *Sphaerosyllis* Claparède, 1863 (12 species); *Brania* Quatrefages, 1866 (3 species); *Parapionosyllis* Fauvel, 1923 (2 species); and *Exogone* Örsted, 1845 (29 species). A total of 22 new species are described: *Salvatoria pilkena*, *S. koorineclavata*, *Prosphaerosyllis battiri*, *Erinaceusyllis cirripapillata*, *E. etiennei*, *E. kathrynae*, *E. hartmannschroederiae*, *Sphaerosyllis bardukaciculata*, *S. goorabantennata*, *S. voluntariorum*, *S. georgeharrisoni*, *Parapionosyllis winnunga*, *P. richardi*, *Exogone* (*Parexogone*) *patriciae*, *E. (P.) annamurrayae*, *E. (P.) penelopeae*, *E. (P.) wilsoni*, *Exogone* (*Exogone*) *koorenborongi*, *E. (E.) haswelli*, *E. (E.) ingridae*, *E. (E.) goorapuranga*, *E. (E.) arrakatarkoola*. Additionally, 13 species are new records for Australia: *Exogone* (*P.*) *homosetosa* (Hartmann-Schröder, 1965b); *E. (P.) wolffi* San Martín, 1991a; *E. (P.) caribensis* San Martín, 1991; *E. (P.) gambiae* Lanera, Sordino & San Martín, 1994; *Exogone* (*E.*) *longicornis* Westheide, 1974; *E. (E.) lourei* Berkeley & Berkeley, 1938; *E. (E.) breviantennata* Hartmann-Schröder, 1959; *E. (E.) dispar* (Webster, 1879); *E. (Sylline)* *naidinoidea* Westheide, 1974; *Sphaerosyllis capensis* Day, 1953; *Prosphaerosyllis isabellae* Nogueira, San Martín & Amaral, 2001; *Erinaceusyllis bidentata* (Hartmann-Schröder, 1974); and *E. belizensis* (Russell, 1989). The Australian records of *Sphaerosyllis perspicax* Ehlers, 1908, and *S. sublaevis* Ehlers, 1913 should be referred to other species, and are not included (see Ehlers, 1908; 1913). A general discussion of the reproduction and systematics of the subfamily is given.

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proportionally slender, through 4 segments; pharyngeal tooth small, oval, located near opening (Fig. 30A,B); pharyngeal papillae apparently absent. Proventricle barrel-shaped, through 3 segments, with about 17 muscle cell rows. Pygidium small, with two anal cirri similar to dorsal cirri but longer.

Distribution. Australia (Victoria, New South Wales, Tasmania, South Australia, and Western Australia).

Habitat. Coarse sand, shell and gravel, amongst algae, in encrustations, sponges, ascidians and bryozoans, coral rubble; intertidal to 27 m depth.

Erinaceusyllis bidentata
(Hartmann-Schröder, 1974) n.comb.

Fig. 31A–F

Sphaerosyllis erinaceus bidentata Hartmann-Schröder, 1974a: 134, pl. 13, figs. 116–119; 1992b: 227, figs. 16–18.

Material examined. AUSTRALIA: WESTERN AUSTRALIA. 1 specimen, AM W26723, north end of Long Island, Goss Passage, 28°27.9'S 113°46.3'E, dead coral covered in coralline algae & brown algae, 6 m, C. Bryce, 22 May 1994. 1 specimen, AM W27642, north end of beach, Bundegi Reef, Exmouth Gulf, 21°49'S 114°11'E, rocky rubble, brown algae with epiphytes, 2 m, H.E. Stoddart, 4 Jan 1984.

Description. Body small to minute, 1.3 mm long, 0.14 mm wide, 24 chaetigers (incomplete specimen), covered with small, scattered papillae, more conspicuous on lateral margins of segments, also some papillae on dorsal cirri (Fig. 31A). Prostomium oval, wider than long; 4 large eyes nearly in line, and 2 anterior eyespots; antennae spindle-shaped with bulbous bases, shorter than combined length of prostomium and palps together, median antenna inserted slightly anterior to eyes; lateral antennae inserted on anterior margin, near eyespots. Palps similar in length to prostomium, fused along their length. Peristomium similar in length to following segments, covering dorsally posterior margin of prostomium, frontally slightly excavate (Fig. 31A); tentacular cirri similar to antennae but smaller. Dorsal cirri similar to antennae, longer than tentacular cirri, with bulbous bases and slightly elongated tip, absent on chaetiger 2 (Fig. 31A). Compound chaetae heterogomph, similar throughout; blades distinctly bidentate, margin provided with moderate-sized erect spines on bases of longer blades (Fig. 31B,F), short marginal spines of short blades (Fig. 31B,F); dorsoventral gradation in length, 26–12 µm on midbody. Dorsal simple chaetae from anterior parapodia, unidentate, smooth (Fig. 31C). Ventral simple chaetae slender, smooth, unidentate (Fig. 31E), present on posterior parapodia. Acicula solitary, acuminate (Fig. 31D). Pharynx proportionally long and slender, through 4 segments; pharyngeal tooth located slightly posterior to opening (Fig. 31A). Proventricle long and wide, barrel-shaped, through 3 segments, with about 20 muscle cell rows.

Remarks. This species is characterized by having all the compound chaetae bidentate and the anterior position of the median antenna. The previous descriptions show similar compound chaetae; the longer blades, however, are more slender and elongated. *Erinaceusyllis cryptica* (Ben-Eliahu, 1977) and *Erinaceusyllis bilobata* (Perkins, 1981) also have all compound chaetae with bidentate blades, but the median

antenna is inserted more posteriorly (Ben-Eliahu, 1977; San Martín, 2003; Perkins, 1981; Russell, 1991). *Erinaceusyllis parvoculata* (Russell, 1989) has also similar compound chaetae, but the arrangement of eyes is distinctly different and the median antenna is inserted much more posteriorly (Russell, 1989).

Distribution. Eastern Africa (Mozambique). Australia (Western Australia).

Habitat. Sand, mixed bottoms (sand, algae, detritus, dead coral), shallow depth.

Erinaceusyllis belizensis (Russell, 1989) n.comb.

Fig. 32A–E

Sphaerosyllis belizensis Russell, 1989: 375, fig. 1; Olano *et al.*, 1998: 86, fig. 2.

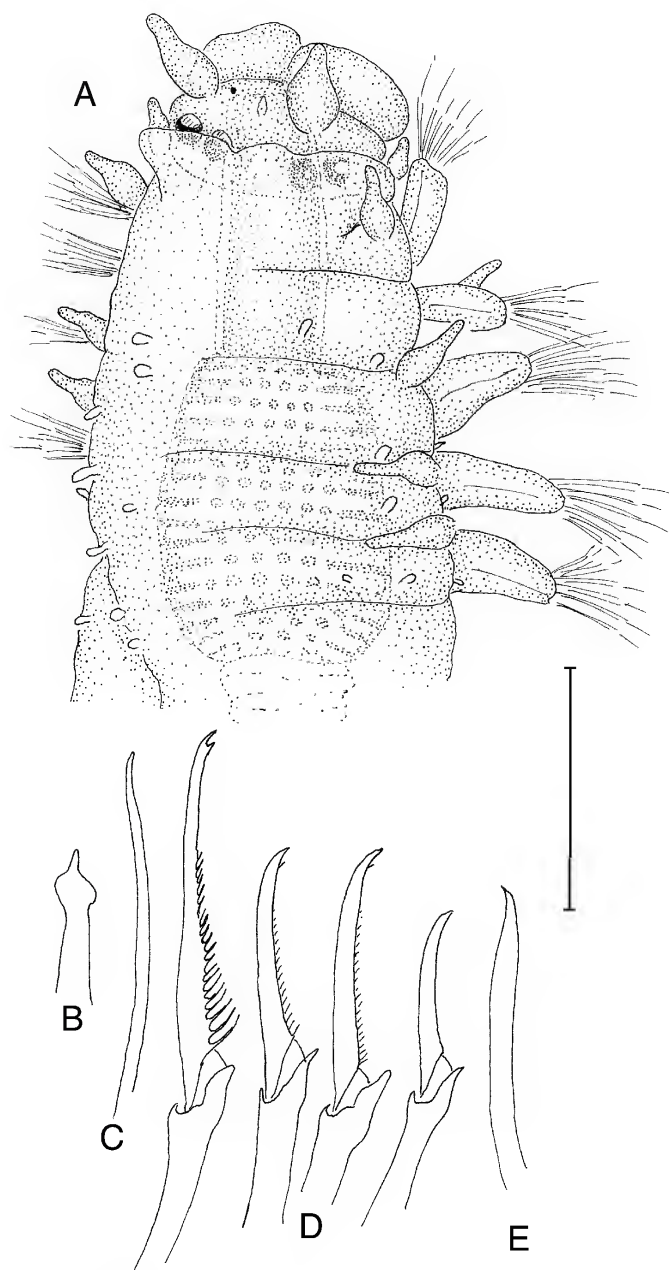


Fig. 32. *Erinaceusyllis belizensis*. (A) anterior end, dorsal view (median antenna missing). (B) acicula. (C) dorsal simple chaeta. (D) compound chaetae, midbody. (E) ventral simple chaeta. Scale A: 0.1 mm, B–E: 20 µm.

Material examined. AUSTRALIA: WESTERN AUSTRALIA. 1 specimen, AM W26803, limestone reef, off Ned's camp, Cape Range National Park, 21°59'S 113°55'E, sponge with epiphytic algae, and muddy worm tubes, 1.5 m, R.T. Springthorpe, 2 Jan 1984.

Description. Body minute, up to 1.18 mm long, 0.16 mm wide, 20 chaetigers, with scattered small papillae on dorsum and laterally, partially covered by debris. Prostomium oval, wider than long; 4 large eyes in trapezoidal arrangement, nearly in line, and 2 anterior eyespots; antennae spindle- to onion-shaped, with bulbous bases and short to moderately tips; median antenna similar to combined length of prostomium and palps, inserted between eyes, lateral antennae shorter than median antenna, inserted near anterior margin, lateral to eyespots. Palps shorter than prostomium, fused along their length. Peristomium forming a distinct, trilobed hood covering posterior part of prostomium (Fig. 32A); tentacular cirri similar to antennae but much smaller. Dorsal cirri shorter than antennae, longer than tentacular cirri, with bulbous bases and short tips, absent on chaetiger 2 (Fig. 32A), more elongate on midbody. Parapodia conical, with a few papillae. Compound chaetae heterogomph; parapodia each with 1 compound chaeta provided with proportionally long, slender, bidentate blade, about 32 μ m, smooth distally, provided with fine, moderately long marginal spines on bases, and 6–7 anteriorly, 4–5 posteriorly, compound chaetae with smooth margin or provided with short, straight spines, unidentate or provided with minute subdistal spine, distally slightly hooked (Fig. 32D), 22–15 μ m long. Dorsal simple chaetae from anterior parapodia, unidentate, apparently smooth (Fig. 32C). Ventral simple chaetae slender, smooth, unidentate (Fig. 32E), present on posterior parapodia. Acicula solitary, acuminate (Fig. 32B). Pharynx proportionally slender, through 3 segments; pharyngeal tooth small, located near pharynx opening (Fig. 32A). Proventricle barrel-shaped, through 3 segments, with about 18 muscle cell rows. Pygidium small, with numerous long papillae, anal cirri elongate.

Distribution. Belize, Western and Eastern Mediterranean, Australia (Western Australia).

Habitat. On mangrove roots, on bryozoans, corals, and algae, mud, on shallow water.

Erinaceusyllis centroamericana
(Hartmann-Schröder, 1959) n.comb.

Fig. 33A–D

Sphaerosyllis centroamericana Hartmann-Schröder, 1959: 127, figs. 79–82; 1965a: 117; 1974a: 135, pl. 13, figs. 120–122; 1977: 58, fig. 20; 1979: 102; 1980a: 54; 1980b: 395; 1981: 36; 1986: 42; 1990: 54. Westheide, 1974: 101, figs. 45, 46 D, E.

Material examined. AUSTRALIA: WESTERN AUSTRALIA. 1 specimen, HZM P-16696, Broome, G. Hartmann-Schröder.

Additional material. EL SALVADOR: 6 specimens, HZM P-14610 G. Hartmann-Schröder.

Description. Body small to minute, up to 2 mm long, 0.16 mm wide, 21 chaetigers, covered with small, scattered papillae (Fig. 33A). Prostomium oval to trapezoidal; 4 small eyes in rectangular arrangement, and 2 anterior eyespots, close to anterior eyes, similar in size to eyes (Fig. 33A); antennae pyriform, with bulbous bases and short tips, all similar in size, shorter than prostomium, inserted nearly in line, in front of anterior eyes and eyespots. Palps short, fused along their length. Peristomium long, covering dorsally more than posterior half of prostomium (Fig. 33A); tentacular cirri similar to antennae. Dorsal cirri similar to antennae, with bulbous bases and short tips, slightly elongate on midbody, absent on chaetiger 2 (Fig. 33A). Compound chaetae heterogomph, similar throughout; blades slender,

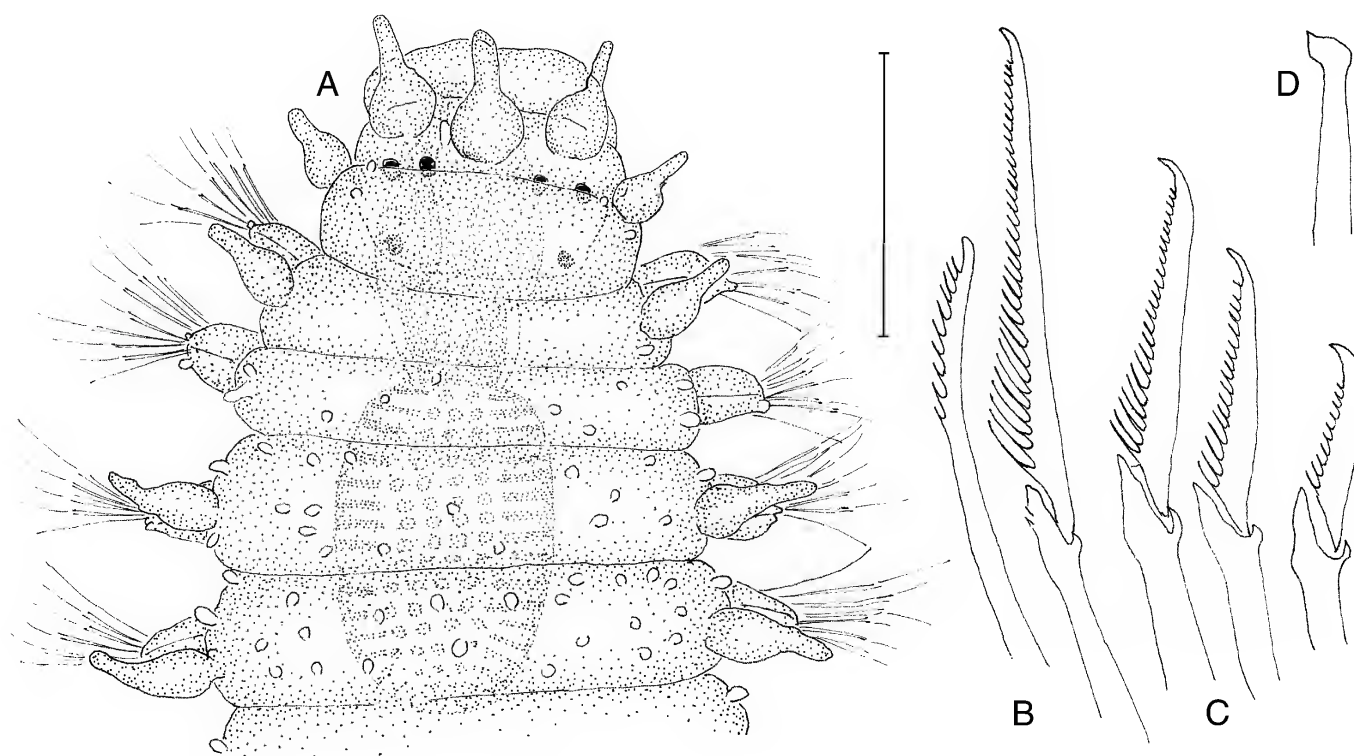


Fig. 33. *Erinaceusyllis centroamericana*. (A) anterior end, dorsal view (median antenna missing). (B) dorsal simple chaeta. (C) compound chaetae. (D) acicula. Scale A: 0.9 mm, B–D: 20 μ m.

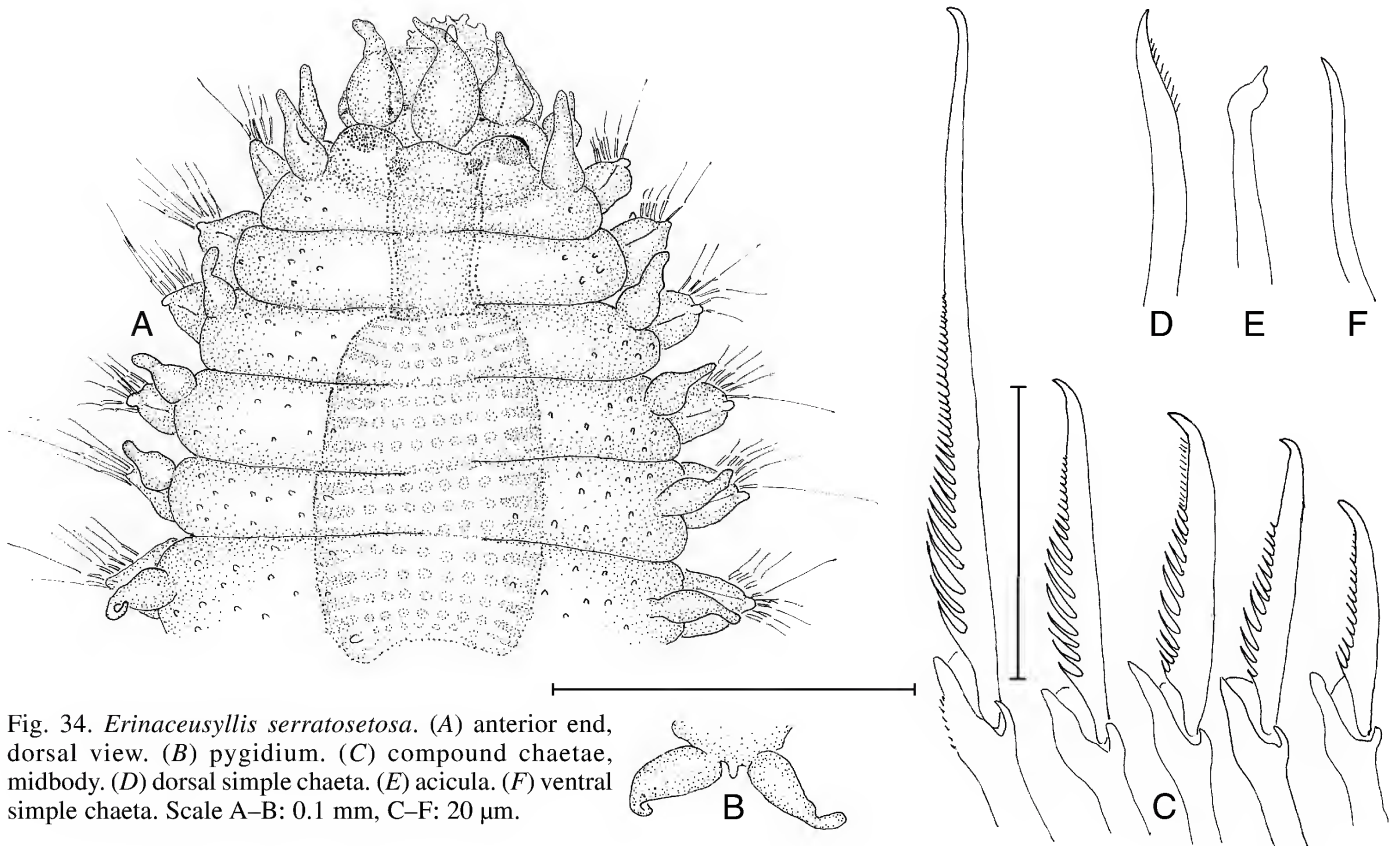


Fig. 34. *Erinaceusyllis serratosetosa*. (A) anterior end, dorsal view. (B) pygidium. (C) compound chaetae, midbody. (D) dorsal simple chaeta. (E) acicula. (F) ventral simple chaeta. Scale A–B: 0.1 mm, C–F: 20 μ m.

elongate, unidentate, distally slightly hooked, provided with proportionally long marginal spines on bases of longer blades (Fig. 33C); parapodia each with 1 compound chaeta with long blade, about 36 μ m on midbody, and 6 compound chaetae with dorsoventral gradation, 25–15 μ m long (Fig. 33C). Dorsal simple chaetae from chaetiger 1, unidentate, provided with short marginal spines (Fig. 33B). Ventral simple chaetae slender, smooth, present on posterior parapodia (fide Westheide, 1974), not seen in the examined specimens. Acicula solitary, acuminate (Fig. 33D). Pharynx proportionally long and slender, through 3–4 segments; pharyngeal tooth small, located near opening (Fig. 33A). Proventricle barrel-shaped, through 2–3 segments, with about 15–20 muscle cell rows. Pygidium small, with two anal cirri similar to dorsal cirri but distinctly longer.

Remarks. *Erinaceusyllis renaudae* Hartmann-Schröder, 1958, from Cuba and Bahamas, is similar but lacks eyes and has a shorter proventricle (Hartmann-Schröder, 1958; 1973).

Distribution. Circumtropical: El Salvador, Galápagos Islands, Caribbean Sea, Hawaii, Samoa, Angola, Mozambique, Tanzania. Australia (Western Australia, South Australia, Queensland).

Habitat. On sand, algae and mangroves. Intertidal.

Erinaceusyllis serratosetosa
(Hartmann-Schröder, 1982) n.comb.

Fig. 34A–F

Sphaerosyllis erinaceus serratosetosa Hartmann-Schröder, 1982: 70, figs. 57–59; 1983: 134; 1990: 54; 1991: 39.

Sphaerosyllis erinaceus (not Claparède).—Hartmann-Schröder, 1979: 102; 1980a: 54.

Material examined. AUSTRALIA: QUEENSLAND. 2 specimens, AM W26703, Triangular Islets, Shoalwater Bay, 22°23'S 150°31'E, J.A. Lewis & J.R. Forsyth, 1981. 1 specimen, AM W26940, Hinchinbrook Channel, 18°20'S 146°4'E, tidal flats (mud & sand), S. Dittmann, 14 Oct 1989. 1 specimen, and 2 specimens on SEM stub, AM W26941, Hinchinbrook Channel, 18°20'S 146°4'E, tidal flats (mud & sand), S. Dittmann, 22 Oct 1991. 1 specimen, AM W26942, Hinchinbrook Channel, 18°20'S 146°4'E, tidal flats (mud & sand), S. Dittmann, 20 Oct 1991. NEW SOUTH WALES. 1 specimen, AM W11109, Careel Bay, Pittwater, 33°37'S 151°19'E, in *Zostera* beds, P.A. Hutchings, 30 July 1973. 1 specimen, AM W23549, Weeney Bay, Botany Bay, 34°01.3'S 151°09.7'E, mud, 1 m, A. Roach & A. Jones, 30 Mar 1995. 5 specimens, AM W23550, Weeney Bay, Botany Bay, 34°01.3'S 151°09.7'E, mud, 1 m, A. Roach & A. Jones, 30 Mar 1995. 6 specimens, AM W23551, Weeney Bay, Botany Bay, 34°01.3'S 151°09.7'E, mud, 1 m, A. Roach & A. Jones, 30 Mar 1995. 4 specimens, AM W23559, Weeney Bay, Botany Bay, 34°01.3'S 151°09.7'E, mud, 1 m, A. Roach & A. Jones, 30 Mar 1995. WESTERN AUSTRALIA. PARATYPES: 2 specimens, AM W18556, Cervantes, 30°30'S 115°03'E, fine sand among *Posidonia*, intertidal, G. Hartmann-Schröder, 24 Oct 1975. 1 specimen, AM W26833, Bush Bay, 30 km south of Carnarvon, 25°10'S 113°39'E, on shallow sand flats, 0.5 m, J.K. Lowry & H.E. Stoddart, 6 Jan 1984.

Description. Body small to minute, up to 2.5 mm long, 0.14 mm wide, up to 34 chaetigers, usually smaller, provided with small, scattered papillae (Fig. 34A). Prostomium oval to pentagonal; 4 large eyes in trapezoidal arrangement, nearly in line, and 2 anterior eyespots; antennae with bulbous bases and short tips; median antenna similar to combined length of prostomium and palps, inserted slightly anteriorly to posterior eyes; lateral antennae shorter than median antenna, inserted on anterior margin, slightly posterior to eyespots. Palps shorter than prostomium, fused along their length. Peristomium shorter than following segments, covering dorsally posterior margin of prostomium, sometimes trilobed (Fig. 34A); tentacular cirri similar to antennae but smaller. Dorsal cirri shorter than antennae, longer than tentacular cirri, with bulbous bases and short tips, absent on chaetiger 2 (Fig. 34A). Parapodia rectangular to conical, with a distal papilla and, sometimes, other smaller

distal papilla. Compound chaetae heterogomph, shafts marginally smooth or provided with short subdistal spines; blades elongate, unidentate, distally slightly hooked, margin provided on bases with long, erect spines, especially long on longer blades, short spines on middle, smooth on distal third (Fig. 34C); parapodia each with 1–2 compound chaetae with long, spiniger-like blade, about 52 μm on midbody, and 9 on anterior, 6 on midbody, 3 on posterior parapodia, similar but much shorter, with dorsoventral gradation, 26–16 μm on midbody. Dorsal simple chaetae from anterior parapodia, usually from chaetiger 1, unidentate, provided with short marginal spines (Fig. 34D). Ventral simple chaetae slender, smooth, unidentate (Fig. 34F), on posterior parapodia. Acicula solitary, acuminate (Fig. 34E). Pharynx proportionally long and slender, through 4 segments; pharyngeal tooth small, near opening (Fig. 34A). Proventricle long and wide, barrel-shaped, through 4 segments, with about 22 muscle cell rows. Pygidium small, with two anal cirri similar to dorsal cirri but longer, and a median papilla (Fig. 34B).

Distribution. Australia (Western Australia, Queensland, New South Wales). Recently reported a single specimen from Western Mediterranean (San Martín, 2003).

Habitat. Sand, mud, on seagrasses, in shallow water.

Erinaceusyllis ettiennei n.sp.

Fig. 35A–F

Material examined. AUSTRALIA: QUEENSLAND. HOLOTYPE: AM W26624, Halifax Bay, north of Townsville, 19°10'S 146°44'E, 5 m, Queensland Nickel Pty Ltd, July 1977. PARATYPES: 3 specimens, AM W26625, Halifax Bay, north of Townsville, 19°10'S 146°44'E, 5 m, Queensland Nickel Pty Ltd, July 1977. Several fragments on SEM stub, AM W26936, Hinchinbrook Channel, 18°20'S 146°4'E, tidal flats (mud & sand), S. Dittmann, 20 Oct 1991. 1 specimen, AM W26937, Hinchinbrook Channel, 18°20'S 146°4'E, tidal flats (mud & sand), S. Dittmann, 14 Oct 1989. several fragments on SEM stub, AM W26938, Hinchinbrook Channel, 18°20'S 146°4'E, tidal flats (mud & sand), S. Dittmann, 20 Nov 1988. 1 specimen, AM W26939, Hinchinbrook Channel, 18°20'S 146°4'E, tidal flats (mud & sand), S. Dittmann, 20 Nov 1988. 1 specimen, AM W27668, Hinchinbrook Channel, 18°20'S 146°4'E, tidal flats (mud & sand), S. Dittmann, 22 Oct 1991.

Description. Body small to minute, 1.2 mm long, 0.15 mm wide, 19–22 chaetigers, covered with small, scattered, indistinct papillae. Prostomium oval, wider than long; 4 large eyes in trapezoidal arrangement, nearly in line, and 2 anterior eyespots; antennae with bulbous bases and with short tips; median antenna similar to combined length of prostomium and palps, inserted slightly in front to anterior eyes; lateral antennae shorter than median antenna, inserted on anterior margin, near eyespots. Palps similar in length to prostomium, fused along their length, but with a distinct distal notch. Peristomium similar to following segments, covering dorsally posterior margin of prostomium, slightly bilobed (Fig. 35A); tentacular cirri similar to antennae but smaller. Dorsal cirri shorter than antennae, longer than tentacular cirri, with bulbous bases and short tips, absent on chaetiger 2 (Fig. 35A). Compound chaetae heterogomph, similar throughout; blades slender, elongate, unidentate, distally slightly hooked, margin provided with short, thin spines on longer blades (Fig. 35C); parapodia each with 2 compound chaetae with long, spiniger-like blade, about 53–48 μm on midbody, and other 6 provided with filiform, curved, sabre-shaped blades,

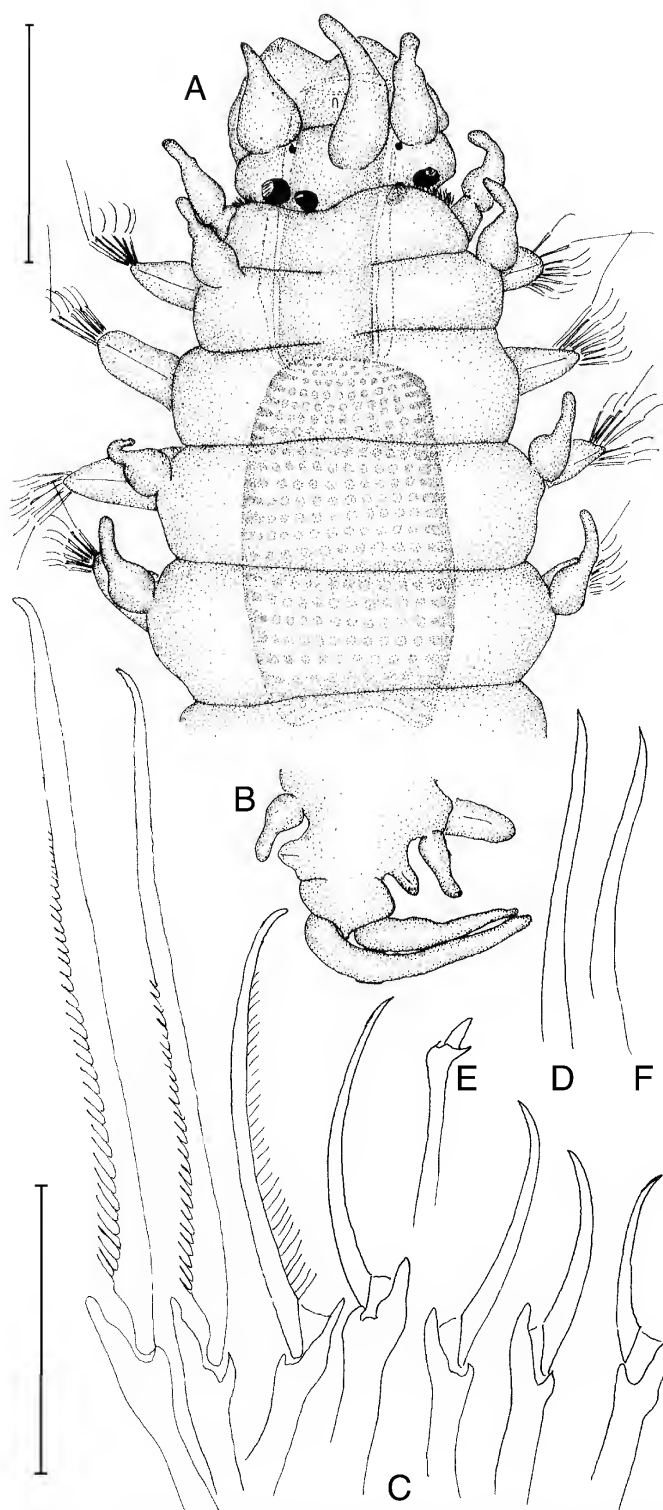


Fig. 35. *Erinaceusyllis ettiennei* n.sp. (A) anterior end, dorsal view. (B) posterior end, dorsal view. (C) compound chaetae, midbody. (D) dorsal simple chaeta. (E) acicula. (F) ventral simple chaeta. Scale A,B: 0.1 mm, C–F: 20 μm .

with normal dorsoventral gradation, 30–13 μm long. Dorsal simple chaetae from midbody, unidentate, smooth (Fig. 35D). Ventral simple chaetae slender, smooth, unidentate (Fig. 35F), present on posterior parapodia. Acicula solitary, acuminate (Fig. 35E), with minute subdistal spines. Pharynx proportionally long and slender, through 4 segments; pharyngeal tooth small, located near opening (Fig. 35A), pharynx without papillae on anterior rim. Proventricle long and wide, barrel-shaped, through 4 segments, with about 22 muscle cell rows. Pygidium small, with two anal cirri similar to dorsal cirri but distinctly longer, and a median papilla (Fig. 35B).

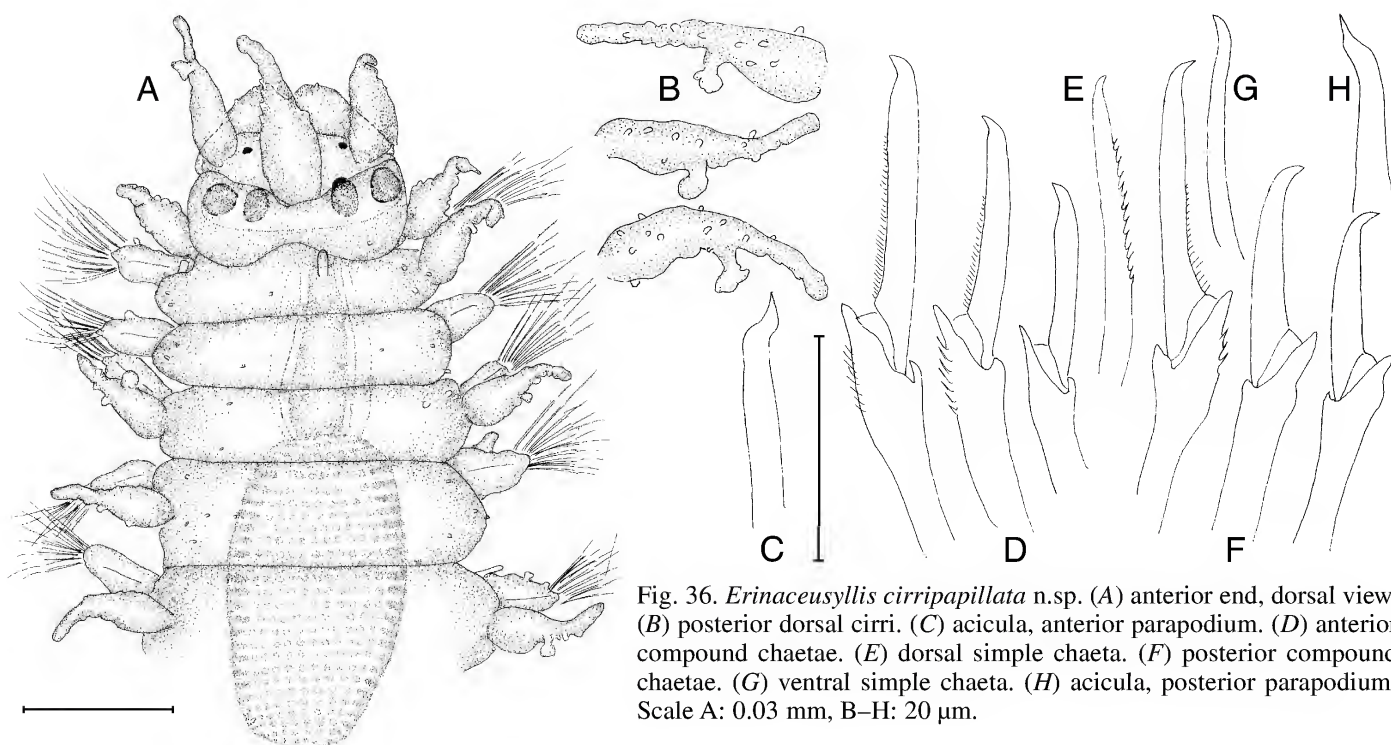


Fig. 36. *Erinaceusyllis cirripapillata* n.sp. (A) anterior end, dorsal view. (B) posterior dorsal cirri. (C) acicula, anterior parapodium. (D) anterior compound chaetae. (E) dorsal simple chaeta. (F) posterior compound chaetae. (G) ventral simple chaeta. (H) acicula, posterior parapodium. Scale A: 0.03 mm, B–H: 20 µm.

Remarks. This species is characterized by the compound chaetae, with slender, thin blades, curved as a sabre. The most similar species is *Erinaceusyllis serratosetosa*, but this species can be differentiated by the size of body and the compound chaetae, which have long, curved marginal spines on the long blades.

Distribution. Australia (Queensland).

Habitat. Mud on shallow water.

Etymology. This species is named in honour of Mr Etienne Fourie.

Erinaceusyllis cirripapillata n.sp.

Fig. 36A–H

Material examined. AUSTRALIA: NEW SOUTH WALES. HOLOTYPE: AM W26711, North Creek Canal, Richmond River, 28°52.1'S 153°32.8'E, mud, 3 m, P.B. Berents, S.J. Keable & A. Murray, 02 Mar 1992, NSW 627.

Description. Body small, 2.5 mm long, 0.18 mm wide, 31 chaetigers, provided with small, scattered papillae on dorsum, more abundant on lateral margins of segments (Fig. 36A). Prostomium rectangular, wider than long; 4 large eyes in line, near to posterior margin of prostomium, and 2 anterior eyespots; median antenna longer than combined length of prostomium and palps, inserted between eyes, lateral antennae shorter than median antenna, inserted near anterior margin, slightly posterior and lateral to eyespots. Palps shorter than prostomium, fused along their length, distally notched, provided with few, small papillae. Peristomium shorter than following segments, covering dorsally posterior margin of prostomium, bilobed (Fig. 36A); tentacular cirri similar to antennae but smaller. Dorsal cirri shorter than antennae, longer than tentacular cirri, with bulbous bases and short tips, absent on chaetiger 2, more elongate posteriorly (Fig. 36A,B); antennae, tentacular cirri and dorsal cirri provided with numerous small papillae and 1, sometimes 2, long, distinct papillae, mushroom-shaped,

with a stalk and distally enlarged and truncated (Fig. 36A,B). Parapodia rectangular to conical, with scattered papillae, sometimes similar to those of dorsal cirri. Compound chaetae heterogomph, smooth on margin or provided with short, straight spines on longer blades; blades elongate, unidentate, distally slightly hooked (Fig. 36D,F); anterior parapodia each with 6–7 compound chaetae with dorso-ventral gradation in length, 28–12 µm, 6 on posterior parapodia, similar to those of anterior parapodia but slender. Dorsal simple chaetae from chaetiger 7, unidentate, provided with short marginal spines (Fig. 36E). Ventral simple chaetae slender, smooth, unidentate (Fig. 36G), present on posterior parapodia. Acicula solitary, acuminate (Fig. 36H). Pharynx proportionally slender, through 3 segments; pharyngeal tooth on pharynx opening (Fig. 36A). Proventricle long and wide, barrel-shaped, through 3 segments, with about 26 muscle cell rows. Pygidium small, with numerous papillae, anal cirri missing.

Remarks. *Erinaceusyllis cirripapillata* n.sp., is characterized by having papillae on dorsal cirri, one of them being distinctive, mushroom-shaped. None species of this genus or *Sphaerosyllis* is described having that kind of papillae on dorsal cirri.

Distribution. Australia (New South Wales).

Habitat. Mud in shallow water.

Etymology. The name of the species refers to the distinct, characteristic papillae on the dorsal cirri.

Erinaceusyllis opisthodentata
(Hartmann-Schröder, 1987) n.comb.

Fig. 37A–E

Sphaerosyllis (*Sphaerosyllis*) *erinaceus opisthodentata* Hartmann-Schröder, 1987: 40, figs. 13–16; 1990: 54.

Material examined. AUSTRALIA: VICTORIA. 3 PARATYPES, HZMP-18882,

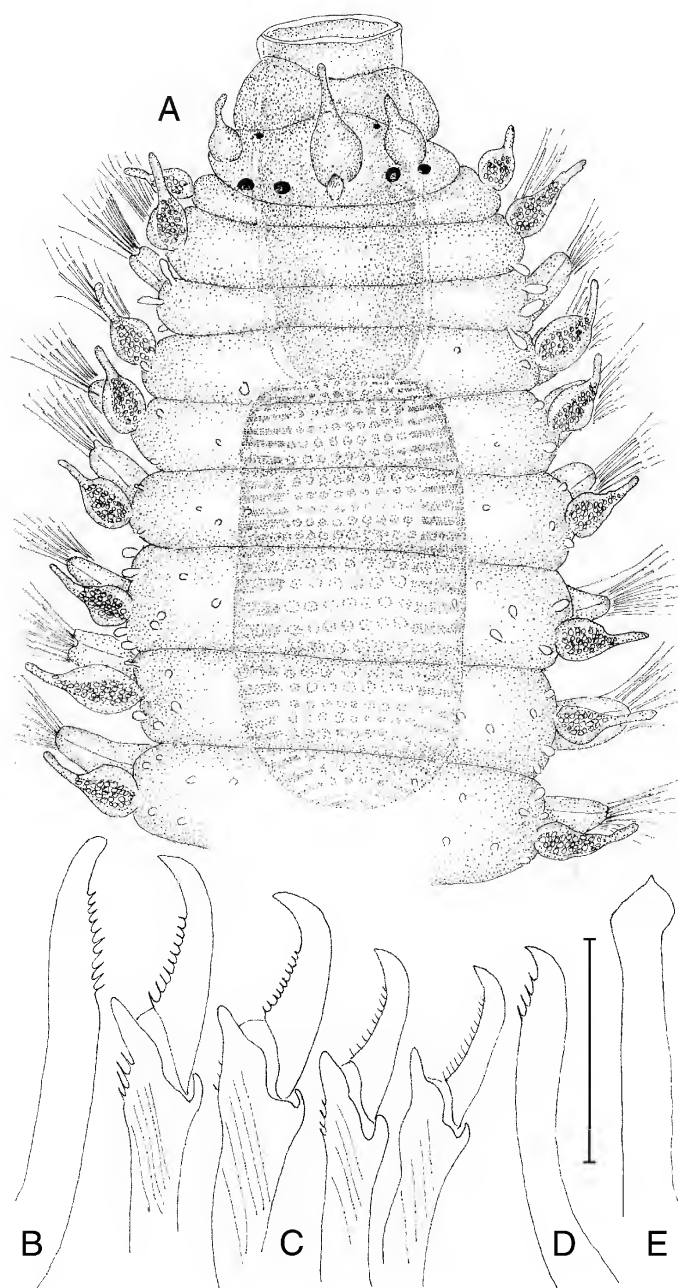


Fig. 37. *Erinaceusyllis opisthodentata*. (A) anterior end, dorsal view (Paratype). (B) dorsal simple chaeta. (C) compound chaetae, mid-posterior parapodium. (D) ventral simple chaeta. (E) acicula. Scale A: 1.6 mm, B–E: 20 μ m.

Warmnambool, coralline algae, G. Hartmann-Schröder, 22 Dec 1975.

Description. Body small, 2.2 mm long, 0.17 mm wide, 26 chaetigers. Small, scattered papillae on dorsum, more abundant on lateral margins of segments, longer on chaetiger 2 (Fig. 37A). Prostomium oval to pentagonal, much wider than long; 4 eyes linearly arranged, on posterior margin of prostomium, and 2 anterior eyespots; antennae with well-developed bulbous bases and moderate, slender tips, median antenna slightly shorter than combined length of prostomium and palps, inserted in front of eyes, lateral antennae distinctly smaller and shorter than median antenna, inserted near lateral margins of prostomium, near to eyespots (Fig. 37A). Palps shorter than prostomium, fused along their length, forming a bilobed structure. Peristomium shorter than following segments (Fig. 37A); tentacular cirri similar to lateral antennae but smaller. Dorsal cirri similar in length

to median antenna, longer than tentacular cirri, with bulbous bases and short tip, provided with conspicuous internal, dark gland, absent on chaetiger 2 (Fig. 37A), more elongate on midbody segments. Compound chaetae heterogomph, blades provided with short, straight marginal spines, unidentate, distally slightly hooked (Fig. 37C); anterior parapodia each with 6–7 compound chaetae with slight dorsoventral gradation in length, about 26–20 μ m long, diminishing in number to 4 on posterior parapodia, similar to those of anterior parapodia but shorter, 22–15 μ m long (Fig. 37C). Dorsal simple chaetae from chaetiger 1, unidentate, provided with short marginal spines (Fig. 37B). Ventral simple chaetae from midbody, slender, unidentate, with short marginal spines (Fig. 37D). Acicula solitary, acuminate, with short tip (Fig. 37E). Pharynx proportionally wide, long, through 5–6 segments when retracted, without papillae on opening; pharyngeal tooth rhomboidal, small, located anterior to middle of pharynx (Fig. 37A). Proventricle long and wide, similar in length to pharynx, barrel-shaped, through 5 segments, with about 17–20 muscle cell rows. One paratype is a female carrying eggs dorsally by means of capillary notochoetae.

Distribution. Australia (Victoria, New South Wales).

Habitat. Algae, encrusting coralline algae. Intertidal.

Erinaceusyllis hartmannschroederiae n.sp.

Figs. 38A–I, 39A–F

Sphaerosyllis erinaceus.—not Claparède, 1863; Hartmann-Schröder, 1982: 69; 1983: 134; 1984: 22; 1985: 70; 1986: 43; 1989: 28; 1991: 39.

Material examined. AUSTRALIA: NEW SOUTH WALES. HOLOTYPE: AM W26447, 100 m north west of Julian Rocks, Byron Bay, 28°36.8'S 153°37.8'E, shell and gravel, 15 m, E.L. Albertson, R.T. *et al.*, 3 Mar 1992. PARATYPES: 36 specimens, AM W26448, 100 m north west of Julian Rocks, Byron Bay, 28°36.8'S 153°37.8'E, shell and gravel, 15 m, E.L. Albertson *et al.*, 3 Mar 1992. QUEENSLAND. 1 specimen, AM W26565, Halifax Bay, north of Townsville, 19°10'S 146°38'E, 5 m, Queensland Nickel Pty Ltd, July 1977. 1 specimen, AM W26569, Halifax Bay, north of Townsville, 19°10'S 146°38'E, 5 m, Queensland Nickel Pty Ltd, July 1977. 1 specimen, AM W26571, Halifax Bay, north of Townsville, 19°10'S 146°44'E, 5 m, Queensland Nickel Pty Ltd, July 1977. 2 specimens, and 4 specimens on SEM stub, AM W26935, Hinchinbrook Channel, 18°20'S 146°4'E, tidal flats (mud & sand), S. Dittmann, 14 Oct 1989. VICTORIA. 1 specimen, MV F87430, Geelong Arm of Port Phillip Bay, Victoria, 38°09.3'S 144°42.7'E, sand & seagrass, 3 m depth, 11 June 1971. TASMANIA. 42 specimens, AM W27670, north end of beach, Parsons Cove, Freycinet National Park, 42°08.6'S 148°16.9'E, clean gravelly sand, intertidal, 0 m, N.W. Riser, 24 Jan 1986. WESTERN AUSTRALIA. 1 specimen, AM W27645, north end of beach, Bundegi Reef, Exmouth Gulf, 21°49'S 114°11'E, rocky rubble, brown algae with epiphytes, sediment, 2 m, H.E. Stoddart, 4 Jan 1984.

Description. Body small, slender, up to 3 mm long, 0.23 mm wide, 30 chaetigers, with scattered, short papillae on dorsum (Figs. 38A, 39A–D), slightly longer laterally, also on parapodia and cirri. Prostomium oval, slightly wider than long; 4 large eyes in trapezoidal arrangement, nearly in line, and 2 anterior eyespots; antennae with bulbous bases and short tips; median antenna shorter than combined length of prostomium and palps, inserted slightly anterior to posterior eyes; lateral antennae shorter than median antenna, inserted on anterior margin, slightly posterior and lateral to eyespots. Palps shorter than prostomium, fused along their length. Peristomium forming a trilobed hood, covering dorsally the

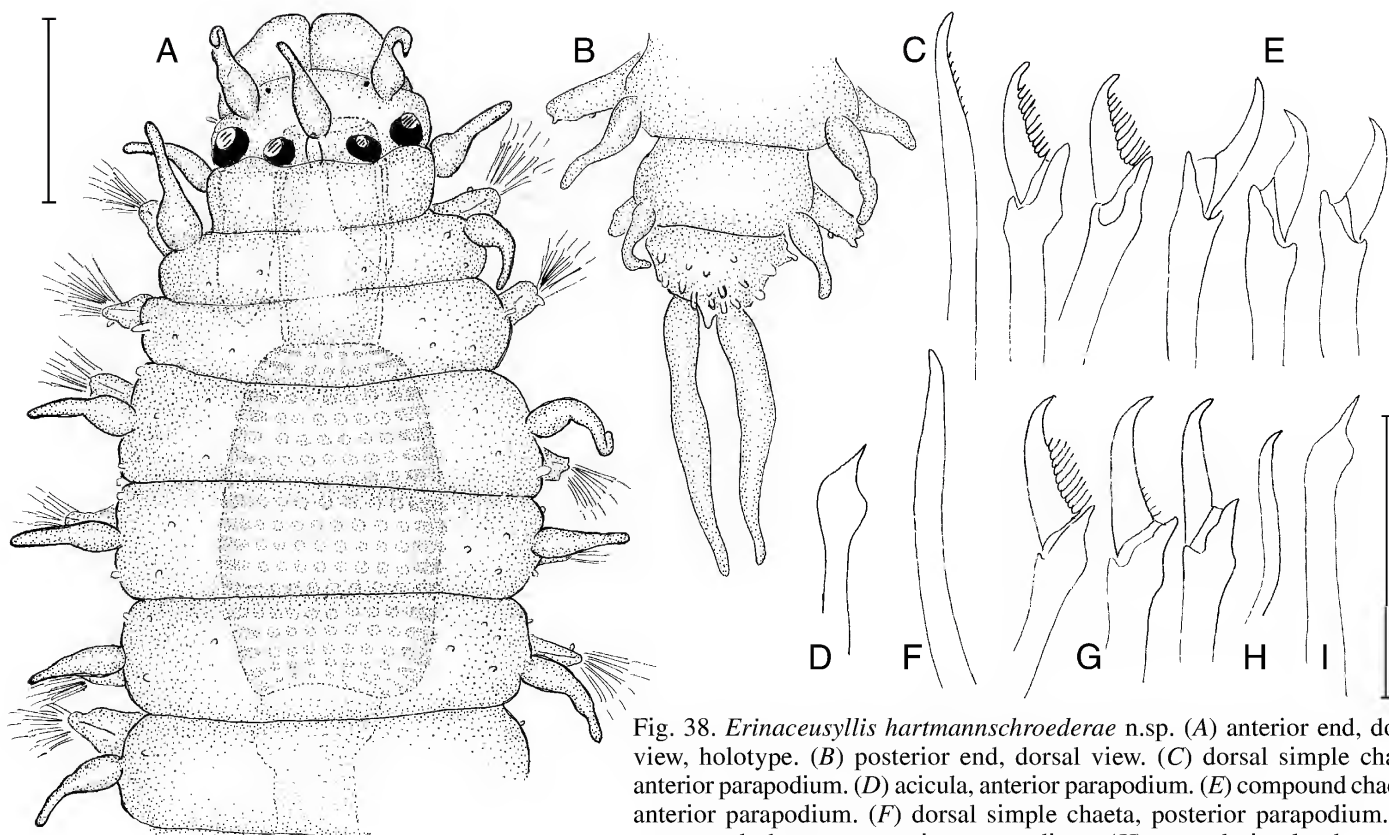


Fig. 38. *Erinaceusyllis hartmannschroederiae* n.sp. (A) anterior end, dorsal view, holotype. (B) posterior end, dorsal view. (C) dorsal simple chaeta, anterior parapodium. (D) acicula, anterior parapodium. (E) compound chaetae, anterior parapodium. (F) dorsal simple chaeta, posterior parapodium. (G) compound chaetae, posterior parapodium. (H) ventral simple chaeta. (I) acicula, posterior parapodium. Scale A,B: 0.1 mm, C–I: 20 µm.

posterior margin of prostomium (Figs. 38A, 39D); tentacular cirri similar to antennae but slightly smaller. Nuchal organs small, densely ciliated, protected by an anterior lip (Fig. 39E). Dorsal cirri similar to antennae, longer than tentacular cirri, with bulbous bases and short tips, absent on chaetiger 2 (Figs. 38A, 39D), elongate in midbody and posterior parapodia (Figs. 38B, 39C). Parapodia rectangular to conical, with two small, distal papillae. Compound chaetae heterogomph, shafts apparently smooth (Fig. 38E,G) but provided with fine subdistal spines (Fig. 39F); blades short, falcate, unidentate, all similar in length, about 13–10 µm on midbody; margin of blades provided with long, slender spines on 2–3 most superior compound chaetae, remaining blades smooth (Figs. 38E,G, 39F); anterior parapodia each with 6–7 compound chaetae, diminishing in number progressively posteriorly to 5 on each posterior parapodia. Dorsal simple chaetae from anterior parapodia, usually from chaetiger 1, unidentate, provided with short marginal spines (Fig. 38C) or smooth (Fig. 38F). Ventral simple chaetae slender, smooth, unidentate (Fig. 38H), on posterior parapodia. Acicula solitary, acuminate (Fig. 38D,I). Pharynx through 4 segments; pharyngeal tooth, near opening (Fig. 38A). Proventricle long and wide, barrel-shaped, through 3–4 segments, with about 18–20 muscle cell rows. Pygidium semi-circular, with two anal cirri similar to dorsal cirri but longer, and several papillae (Fig. 38B).

Remarks. This species was widely reported in Australia as *Sphaerosyllis erinaceus* and *S. erinaceus erinaceus*, a species described from Northern Europe, reported widely all around the world, from Arctic, temperate, tropical, to Antarctic seas. This appear to be a complex of species, in need of revision. There is not a recent redescription of the European specimens, which would probably clarify the situation. Fauvel (1923) states that the blades of the

compound chaetae are long and slender, different from the short, falcate blades of the Australian specimens, suggesting that they are different species. Recently, I have examined some specimens from Spitzbergen identified as *Sphaerosyllis erinaceus* in the HZM collections and the compound chaetae are distinctly different to those reported from Australia, which are in fact a mixture of several of the species herein described in *Erinaceusyllis*. Imajima (1966) reported and described *S. erinaceus* from Japan, which agree quite well with the specimens from Spitzbergen, and these specimens are similar to *E. hartmannschroederiae* n.sp., but the blades show distinct dorsoventral gradation in length. Several subspecies of *S. erinaceus* have been described from several areas, on the basis of differences in the shape and size of the compound chaetae; these differences are sufficiently important to consider them as distinct species.

Distribution. Australia (all states).

Habitat. All kind of sediments, intertidal to about 15 m depth.

Etymology. The species is named in honour to Dr Gesa Hartmann-Schröder, who reported and described many species of syllids from Australia and worldwide.

Erinaceusyllis kathrynae n.sp.

Figs. 40A–H, 41A–F

Material examined. AUSTRALIA: NEW SOUTH WALES. HOLOTYPE: AM W26400, southwest side of South Solitary Island, Australia, 30°12.0'S 153°16.0'E, coral rubble, 18 m, R.T. Springthorpe, 24 Jun 1992. PARATYPE: 1 specimen, AM W26401, Northern side of Bannister Head, 35°19.15'S 150°29.12'E, grey sponge from top of boulder, 18 m, K. Attwood, 6 May 1997. PARATYPE: 1 specimen, AM W26402, southwest side of South Solitary Island, 30°12.0'S 153°16.0'E, coral rubble, 18 m, R.T. Springthorpe, 24 Jun 1992. 1 specimen, AM W26408, 100 m north west of Split Solitary Island, 30°14.0'S 153°10.8'E, encrusting algae &

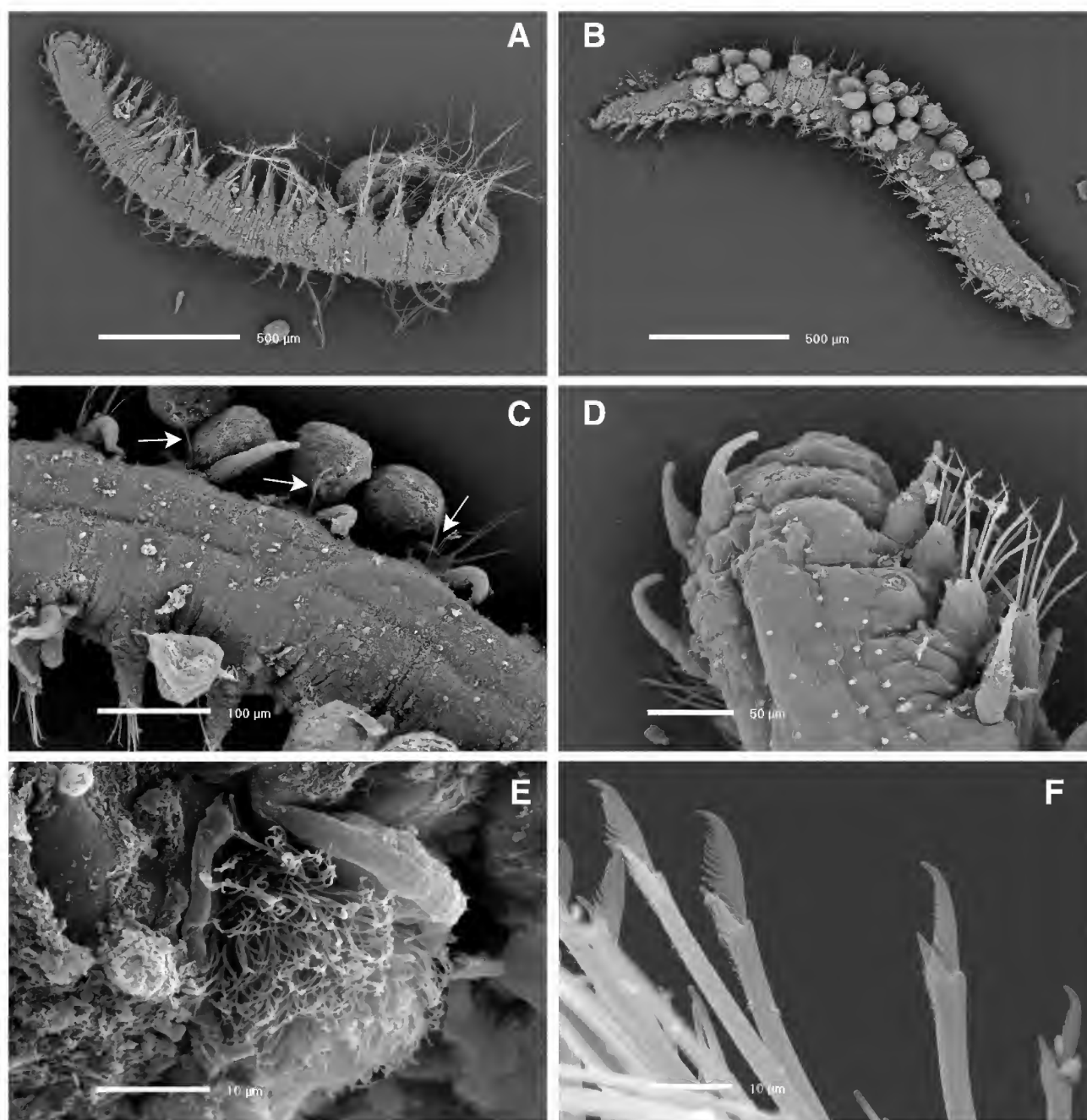


Fig. 39. SEM of *Erinaceusyllis hartmannschroederiae* n.sp. (A) mature male with natatory chaetae, dorsal view. (B) mature female carrying eggs, dorsal view. (C) midbody of the mature female, dorsal view. (D) anterior end, dorsal view (right antenna and dorsal cirrus of chaetiger 1 missing). (E) detail of nuchal organs. (F) compound chaetae, midbody.

ascidians, 16 m, E.L. Albertson, 7 Mar 1992. WESTERN AUSTRALIA. 2 specimens, AM W26815, reef west of groyne, 2 km south of Cape Peron, 32°16'S 115°41'E, orange sponge in deep channel of limestone reef, 4.5 m, R.T. Springthorpe, 26 Dec 1983. 2 specimens on SEM stub, AM W26817, Red Bluff, Kalbarri, 27°42'S 114°09'E, mixed coralline algae from rocky shore, 4 m, J.K. Lowry, 10 Jan 1984. 2 specimens, AM W26826, inshore reef off Ned's Camp, Cape Range National Park, 21°59'S 113°59'E, frilly *Caulerpa* sp., 1 m, J.K. Lowry, 2 Jan 1984.

Description. Body small, holotype 2.3 mm long, 0.16 mm wide, 30 chaetigers, longest paratype 3.1 mm long, 34 chaetigers. Small, scattered papillae on dorsum and palps, more abundant on lateral margins of segments (Figs. 40A, 41A–D). Prostomium oval, wider than long; 4 large eyes in trapezoidal arrangement and 2 anterior eyespots; antennae

spindle-shaped, with bulbous bases and short tips, median antenna similar to combined length of prostomium and palps, inserted between eyes, lateral antennae shorter than median antenna, located near anterior margin, lateral to eyespots. Palps shorter than prostomium, basal half fused, with distinct terminal notch, forming a bilobed structure (Figs. 40A, 41A–C), provided with few, small papillae. Peristomium similar in length to following segments, bilobed, forming 2 anterior lateral wings, covering dorsally posterior margin of prostomium (Figs. 40A, 41B,C); tentacular cirri similar to antennae but smaller. Dorsal cirri shorter than antennae, longer than tentacular cirri, with bulbous bases and short tips, absent on chaetiger 2 (Fig.

Fig. 41 (facing page). SEM of *Erinaceusyllis kathrynae* n.sp. (A) dorsal view, anterior end and midbody. (B) prostomium, peristomium and chaetiger 1 (median antenna missing). (C) anterior end, frontal view. (D) midbody parapodia, dorsal view. (E) compound chaeta, anterior parapodium. (F) compound chaeta, posterior parapodium.

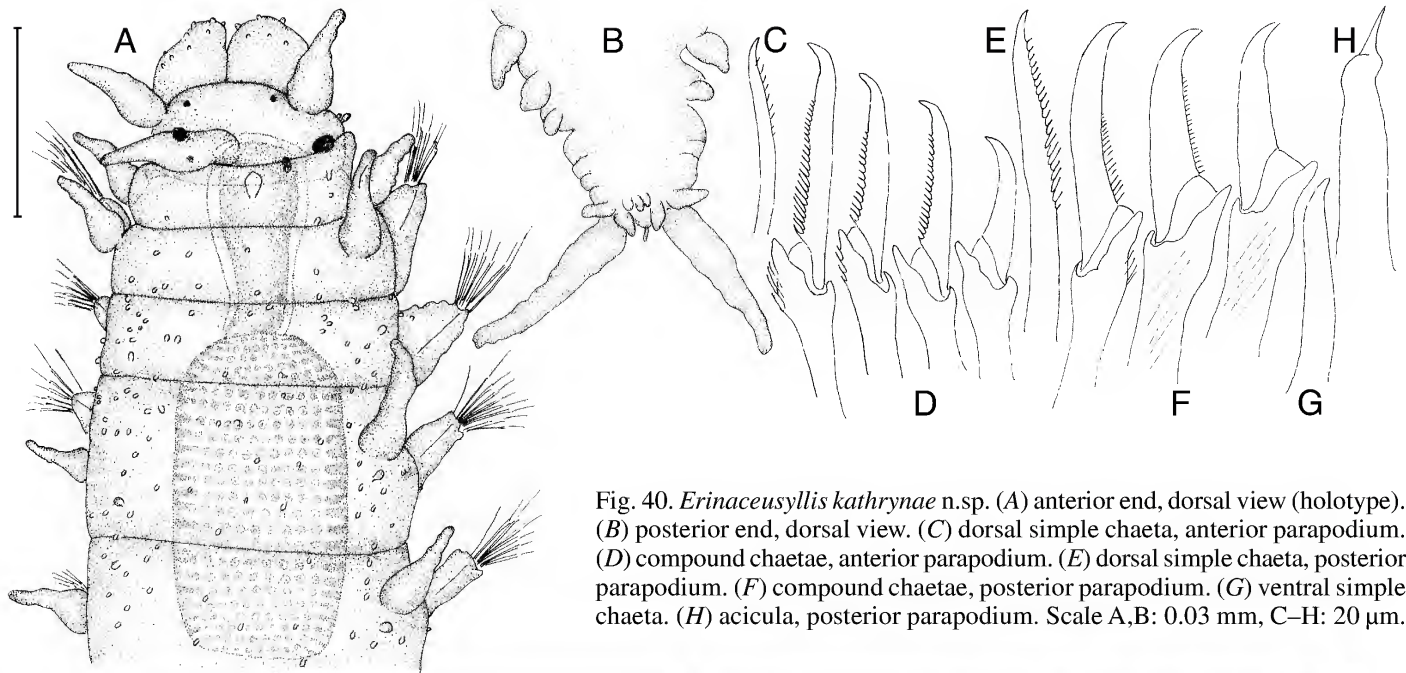
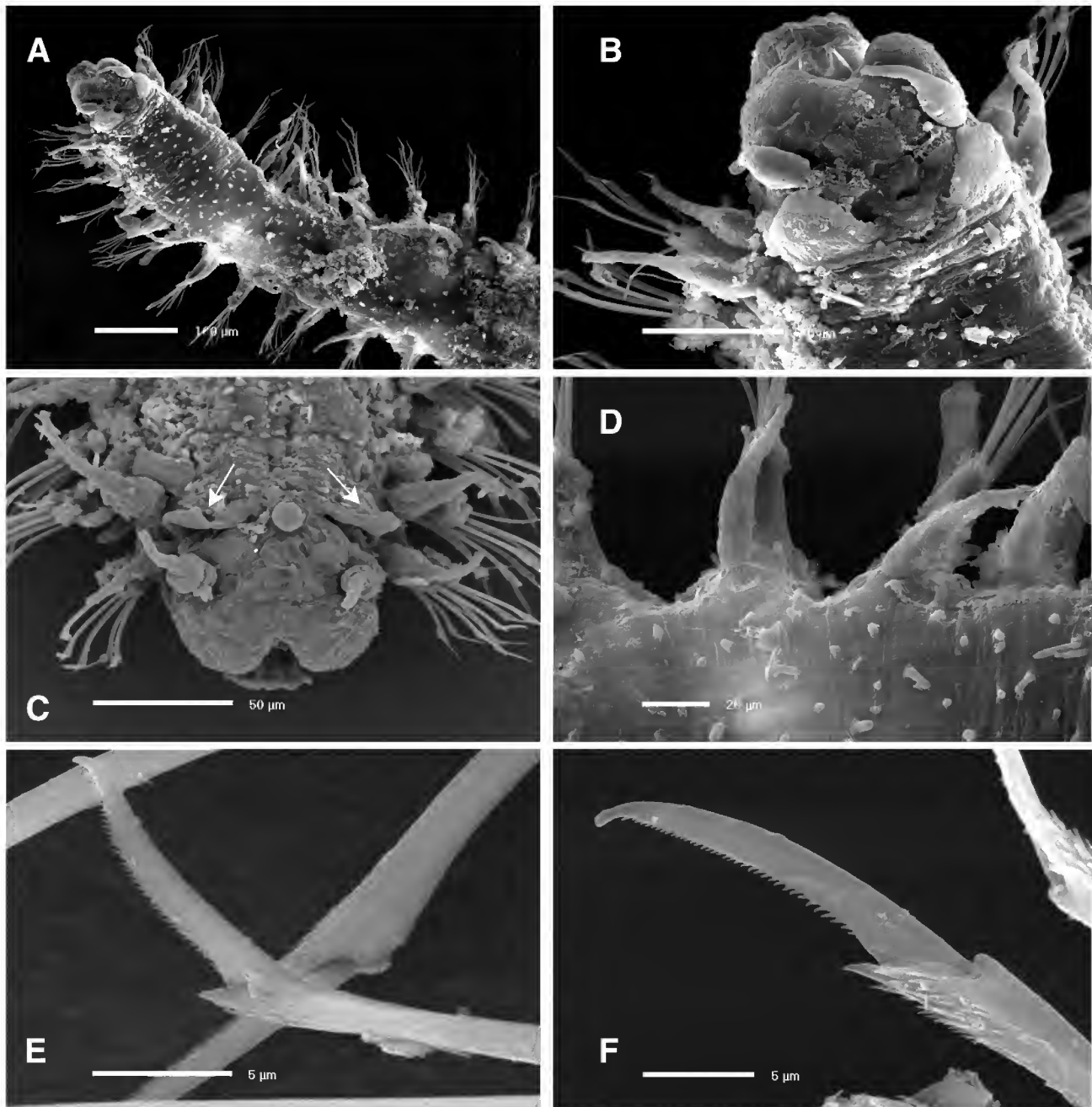


Fig. 40. *Erinaceusyllis kathrynae* n.sp. (A) anterior end, dorsal view (holotype). (B) posterior end, dorsal view. (C) dorsal simple chaeta, anterior parapodium. (D) compound chaetae, anterior parapodium. (E) dorsal simple chaeta, posterior parapodium. (F) compound chaetae, posterior parapodium. (G) ventral simple chaeta. (H) acicula, posterior parapodium. Scale A,B: 0.03 mm, C–H: 20 µm.



41A), more elongate in midbody segments (Fig. 41D). Parapodia conical, with a few papillae. Compound chaetae heterogomph, blades marginally smooth or provided with short, straight spines on longer blades, unidentate, distally slightly hooked (Figs. 40D,F, 41E,F); anterior parapodia each with 5–7 compound chaetae with usual dorsoventral gradation in length (Fig. 40D), 22–13 µm long, 4 compound chaetae on each posterior parapodia, similar to those of anterior parapodia (Fig. 40F). Dorsal simple chaetae from chaetiger 1, unidentate, provided with short marginal spines (Fig. 40C,E). Ventral simple chaetae from midbody, slender, smooth, unidentate (Fig. 40G). Acicula solitary, acuminate, with a long, filiform tip (Fig. 40H). Pharynx proportionally slender, through 3 segments; pharyngeal tooth rhomboidal, small, located near opening (Fig. 40A). Proventricle long and wide, barrel-shaped, through 3 segments, with about 15–17 muscle cell rows. Pygidium small, with numerous long papillae, anal cirri elongate (Fig. 40B).

Remarks. *Erinaceusyllis kathrynae* n.sp. is similar to *E. cirripapillata*, but it lacks the characteristic papillae on the cirri; *Sphaerosyllis perspicax* Ehlers, 1908, which probably belongs to *Erinaceusyllis*, is also similar, but the anterior dorsal cirri are strongly inflated at their bases, the eyes and the antennae are both arranged in line, and the palps are completely fused all along their length (Ehlers, 1908).

Distribution. Australia (New South Wales, Western Australia).

Habitat. Coral rubble, sponges, encrusting and coralline algae, 3–18 m depth.

Etymology. This species is named in honour of Kathryn (Kate) Attwood, of The Australian Museum.

Genus *Sphaerosyllis* Claparède, 1863

Sphaerosyllis Claparède, 1863: 45.

Diagnosis. Body small, provided with similar dorsal and ventral papillae, sometimes extending to cirri and parapodia, usually covered by detritus. Prostomium with 3 antennae, 4 eyes, without eyespots, usually partially covered dorsally by peristomium. Palps fused all along their length. Single pair of tentacular cirri, located lateroventrally, directed to anteriorly. Antennae, tentacular and dorsal cirri short, pyriform to bulbous- or flask-shaped, with sphaerical bases and short, slender tips; dorsal cirri absent on chaetiger 2. Parapodial glands usually present and distinct, with fibrillar, hyaline, or granular material. Parapodia with compound, heterogomph chaetae with unidentate, short blades; dorsal and ventral simple, unidentate chaetae on some parapodia. Aciculae usually solitary, thick, distally bent at right angle; sometimes with another straight, slender acicula in anterior parapodia. Pharynx slender, provided with small, soft papillae around opening; pharyngeal tooth conical, on anterior margin. Proventricle short, provided with few (12–20/23), large muscle cell rows. Reproduction by epigamy with incubation; mature males provided with long, thin natatory chaetae; females without natatory chaetae, brooding eggs and juveniles ventrally.

Type species. *Sphaerosyllis hystrix* Claparède, 1863 (fide Hartman, 1959).

Remarks. The species *Sphaerosyllis bifurcata* and *S. bifurcatoides* were originally described in the genus *Parapionosyllis*; but their characters agree with the diagnosis of *Sphaerosyllis* and differ distinctly with that of *Parapionosyllis* given below. These two species are herein transferred to *Sphaerosyllis*.

Key to species of *Sphaerosyllis* recorded from Australia

- 1 Papillae long, distinct, with slender stalk and expanded, rounded or slightly trilobed tips. Shafts of compound chaetae distally bifid 2
- Papillae small, rounded, without stalk. Shafts not bifid distally 5
- 2 Dorsal simple chaetae of midbody provided with a single, distinct spur and minute spines *Sphaerosyllis rotundipapillata*
- Dorsal simple chaetae without a single, distinct spur 3
- 3 Antennae shorter than prostomium and palps together. Dorsal cirri shorter than parapodial lobes. Dorsal simple chaetae distally serrated *Sphaerosyllis bifurcatoides*
- Antennae and dorsal cirri longer or similar than prostomium and palps together. Dorsal simple chaeta with spines, not serrated 4
- 4 Papillae distinct and numerous from anterior segments. Dorsalmost compound chaetae from midbody with a single, long subdistal spine on blade. Similar spine on ventral simple chaetae *Sphaerosyllis voluntariorum* n.sp.
- Papillae on anterior segments relatively sparse. Compound and simple chaetae without a long, subdistal spine *Sphaerosyllis bifurcata*
- 5 Only simple chaetae from midbody; compound chaetae only on anterior parapodia *Sphaerosyllis bardukaciculata* n.sp.
- Compound chaetae on all parapodia 6

- 6 All antennae in line, inserted on anterior margin of prostomium 7
 — Median antenna inserted more posteriorly than lateral antennae 9
- 7 Dorsum appears smooth, except for few long, slender papillae on pygidium *Sphaerosyllis pygipapillata*
 — Dorsum with distinct papillae 8
- 8 Dorsum densely papillated. Parapodial glands indistinct, with granular or hyaline material *Sphaerosyllis densopapillata*
 — Dorsum relatively sparsely papillated. Parapodial glands distinct, with fibrillar material *Sphaerosyllis capensis*
- 9 Antennae distinctly longer than prostomium and palps together *Sphaerosyllis goorabantennata* n.sp.
 — Antennae similar length or shorter than the combined length of prostomium and palps together 10
- 10 Lateral margins of midbody segments provided with few distinctly long papillae *Sphaerosyllis lateropapillata*
 — Papillae all similar 11
- 11 Parapodial glands large, present from anteriormost segments. Median antenna inserted close to lateral antennae *Sphaerosyllis georgeharrisoni* n.sp.
 — Parapodial glands small, absent on more anterior segments. Median antenna distinctly posterior to lateral antennae, on posterior margin of prostomium *Sphaerosyllis hirsuta*

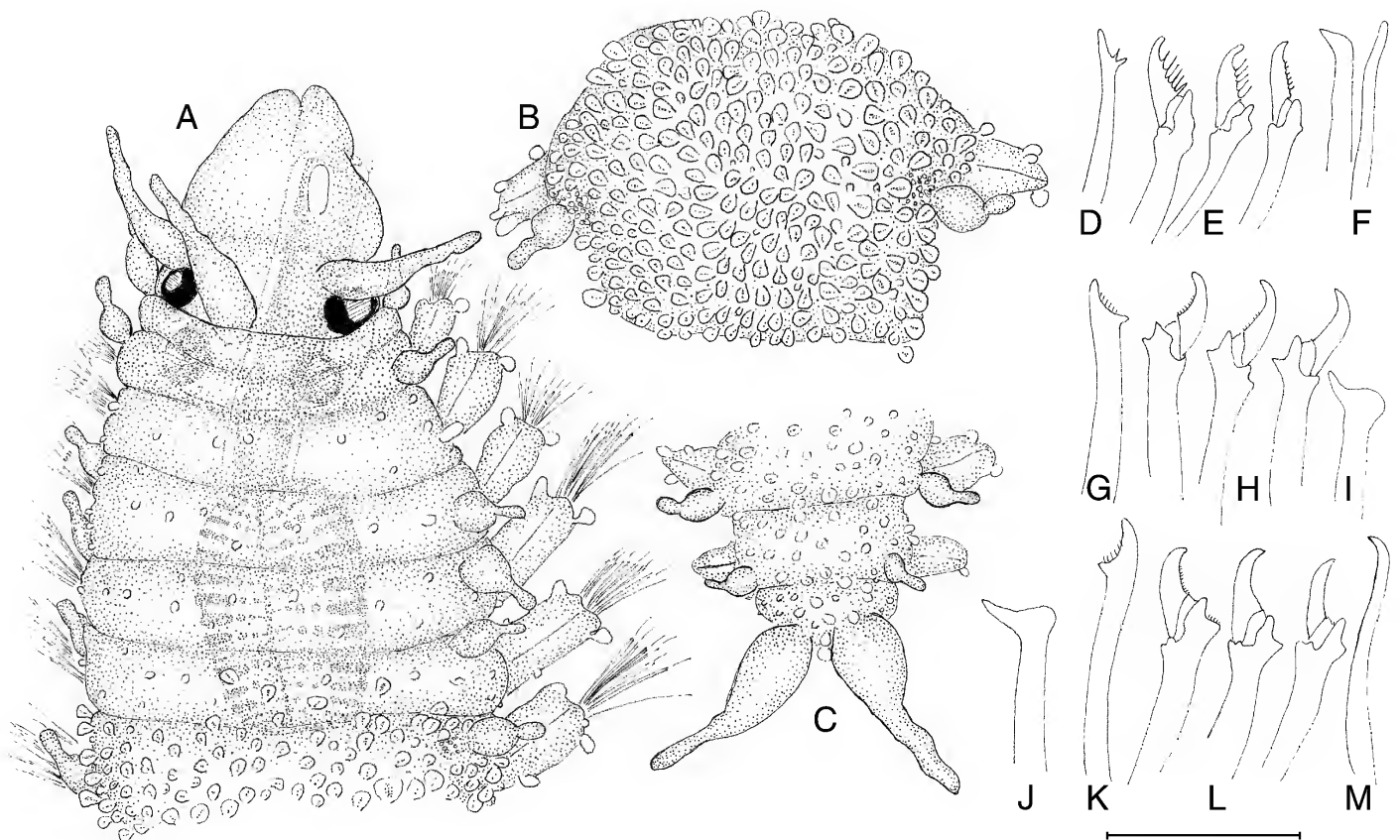


Fig. 42. *Sphaerosyllis rotundipapillata*. (A) anterior end, dorsal view. (B) midbody segment, dorsal view. (C) posterior end, dorsal view. (D) dorsal simple chaeta, anterior parapodium. (E) compound chaetae, anterior parapodium. (F) aciculae, anterior parapodium. (G) dorsal simple chaeta, midbody. (H) compound chaetae, midbody. (I) acicula, midbody. (J) acicula, posterior parapodium. (K) dorsal simple chaeta, posterior parapodium. (L) compound chaetae, posterior parapodium. (M) ventral simple chaeta. Scale A–C: 0.9 mm, D–M: 20 µm.

Sphaerosyllis rotundipapillata
Hartmann-Schröder, 1982

Fig. 42A–M

Sphaerosyllis rotundipapillata Hartmann-Schröder, 1982: 73, figs. 60–68; 1983: 135; 1984: 24; 1985: 24; 1991: 72.

Material examined. AUSTRALIA: WESTERN AUSTRALIA. 3 specimens, HZM P-17069, Fremantle, algae, intertidal, G. Hartmann-Schröder, 2 Nov 1975.

Description. Body small, proportionally long and slender, filiform, up to 4.1 mm long, about 0.17–0.2 mm wide, 38 chaetigers. Anterior segments with few, small round papillae (Fig. 42A); from about chaetiger 6 and midbody chaetigers, papillae numerous (Fig. 42B) covering dorsum, some papillae on parapodia, and ventrum; papillae long, distinct, with slender stalk and expanded, rounded or truncated tips (Fig. 42B), with slightly dark inclusions. Papillae absent on prostomium and palps, sparse on peristomium and more anterior and posterior segments. Prostomium trapezoidal; 4 large eyes in trapezoidal arrangement. Antennae relatively long in relation to dorsal cirri, with bulbous bases and long, slender tips, distinctly shorter than prostomium and palps together (Fig. 42A). Palps similar in length to prostomium, fused along their length, with distal notch. Peristomium shorter than following segments, covering posterior part of prostomium; tentacular cirri small, distinctly shorter than antennae. Dorsal cirri short, similar to tentacular cirri, shorter than parapodial lobes, with bulbous bases and short tips (Figs. 42A,B,C). Parapodial lobes rectangular in dorsal view, provided with 2 distal, rounded papillae (Fig. 42A). Ventral cirri relatively long, slender. Parapodial glands small, difficult to see, with granular material (Fig. 42A,B). Anterior parapodia each with 7 compound chaetae with unidentate blades; shafts more angular and thicker ventrally, with a subdistal small spur (Fig. 42E); blades of dorsal compound chaetae with long, straight marginal spines, about 9–10 µm long, blades of ventral compound chaetae smooth, similar in length to dorsal blades. Number of compound chaetae on each parapodium diminishing posteriorly to 3 on midbody (Fig. 42H) and posterior parapodia (Fig. 42L), with thick shafts provided with strong subdistal spur giving bifurcate appearance, and hooked blades, smooth or provided with short marginal spines, similar in length to those on anterior and midbody compound chaetae. Dorsal simple chaeta from anterior parapodia, usually from chaetiger 1, unidentate, with a distinct subdistal spur, provided with small superior spines (Fig. 42G,K), slender on anterior parapodia (Fig. 42D). Ventral simple chaetae present on posterior parapodia, sigmoid, distally hooked, unidentate, smooth (Fig. 42M). Most anterior parapodia each with one slender, straight acicula and another one bent at tip, forming right angle (Fig. 42F); solitary acicula with bent tip, at right angle in remaining parapodia (Fig. 42I,J). Pygidium small, with some rounded papillae and two anal cirri, similar to dorsal cirri but much longer (Fig. 42C). Pharynx through 3–4 segments; pharyngeal tooth relatively long, conical, on anterior rim (Fig. 42A). Proventricle through 2–3 segments, with 14–18 muscle cell rows.

Distribution. Australia (Western Australia, South Australia and questionably Queensland [Hartmann-Schröder, 1991]).

Habitat. Sand, amongst algae, *Posidonia* beds. Intertidal and shallow bottoms.

Sphaerosyllis bifurcatoides
(Hartmann-Schröder, 1979) n.comb.

Fig. 43A–J

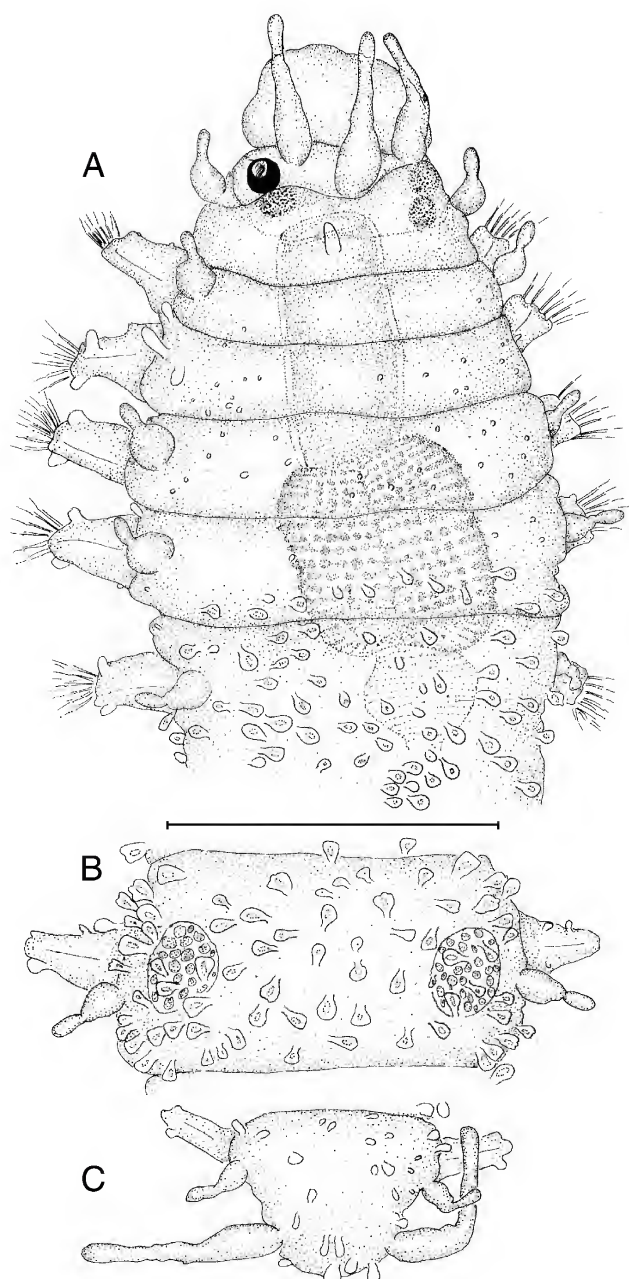
Parapionosyllis bifurcatoides Hartmann-Schröder, 1979: 97, figs. 112–118; 1991: 35.

Material examined. AUSTRALIA: VICTORIA. 14 specimens, MV F62748, Eastern Bass Strait, 11.7 km W of Pt. Ricardo, 37°49.90'S 148°30.01'E, 29 m depth, 28 Sept 1990. 2 specimens, MV F87426, off Werribee, Port Phillip Bay, 38°02.3'S 144°41.3'E, sand, 10 m depth, 10 Jun 1971. WESTERN AUSTRALIA. 1 specimen, AM W26821, the Blow Holes, Point Quobba, 113°25'E 24°39'S, exposed intertidal rock shelf, short tufted clumps of brown algae, 7 Jan 1984.

Description. Body small, slender, 1.9 mm long, 0.15 mm wide, 32 chaetigers. Anterior segments with few, small dorsal papillae (Fig. 43A); from post-proventricular segments posteriorly, papillae numerous (Fig. 43A,B) covering dorsum, some papillae on parapodia; papillae long, distinct, with slender stalk and expanded, rounded or slightly trilobed tips (Figs. 43A,B,G), with dark inclusions. Papillae absent on prostomium and palps, scarce on peristomium and more anterior segments. Prostomium ovate to trapezoidal; 4 large eyes in trapezoidal arrangement. Antennae relatively long, with bulbous bases and long, slender tips, shorter than combined length of prostomium and palps (Fig. 43A) or similar in length. Palps short, broad, fused along their length. Peristomium similar in length to following segments, anterior margin slightly bilobed, covering posterior part of prostomium; tentacular cirri shorter than antennae, with bulbous bases and short, distally rounded tips. Dorsal cirri short, similar to tentacular cirri, slightly shorter than parapodial lobes, with bulbous bases and slender tips (Fig. 43A,B). Parapodial lobes rectangular, provided with 2 distal, rounded papillae (Fig. 43A). Ventral cirri relatively long, slender. Parapodial glands large, difficult to see, with granular material (Figs. 43B). Anterior parapodia each with 6–7 compound chaetae with unidentate, short blades; shafts more angular and thicker ventrally, with a subdistal spur (Fig. 43E); blades of dorsal compound chaetae with moderate, straight marginal spines, blades of ventral compound chaetae smooth, all blades similar in length, about 8 µm long. Number of compound chaetae on each parapodium diminishing posteriorly to 3 on posterior parapodia, with thick shafts provided with strong subdistal spur giving bifurcate appearance, and hooked blades, smooth or provided with short marginal spines (Fig. 43J), similar to those of anterior parapodia. Dorsal simple chaetae from anterior parapodia, unidentate, with few subdistal, irregular serrations on margin (Fig. 43D,I). Ventral simple chaetae present on posterior parapodia, sigmoid, unidentate, smooth (Fig. 43K). Solitary acicula with bent tip, forming right angle (Fig. 43F,H). Pygidium small, with a few rounded papillae and 2 anal cirri, longer than dorsal cirri (Fig. 43C). Pharynx through 3–4 segments; pharyngeal tooth conical, on anterior rim (Fig. 43A). Proventricle small, through 2 segments, with 15 muscle cell rows.

Distribution. Australia (Western Australia, Victoria, Queensland).

Habitat. Sand, coral sand, algae; intertidal to about 15 m depth.



Sphaerosyllis voluntariorum n.sp.

Fig. 44A–I

Material examined. AUSTRALIA: WESTERN AUSTRALIA. HOLOTYPE: AM W26821, Ningaloo reef off Ned's Camp, Cape Range National Park, 21°59.5'S 113°54.5'E, mixed algae, 2 m, J.K. Lowry, 1 Jan 1984.

Description. Body small, slender, 1.4 mm long, 0.14 mm wide, 26 chaetigers. Papillae numerous (Figs. 44A,B,C) covering dorsum, few papillae on parapodia; papillae long, distinct, with slender stalk and expanded, rounded or slightly trilobed tips, with dark inclusions. Papillae absent on prostomium and palps. Prostomium ovate to trapezoidal, wider than long; 4 large eyes in trapezoidal arrangement. Antennae relatively long, with bulbous bases and long, slender tips, similar to combined length of prostomium and palps (Fig. 44A). Palps similar in length to prostomium, fused along their length, ventrally folded. Peristomium similar in length to following segments, covering posterior half of prostomium; tentacular cirri shorter than antennae. Dorsal cirri similar to tentacular cirri, similar in length to parapodial lobes, with bulbous bases and slender tips (Fig. 44A,C), elongate on midbody. Parapodial lobes conical,

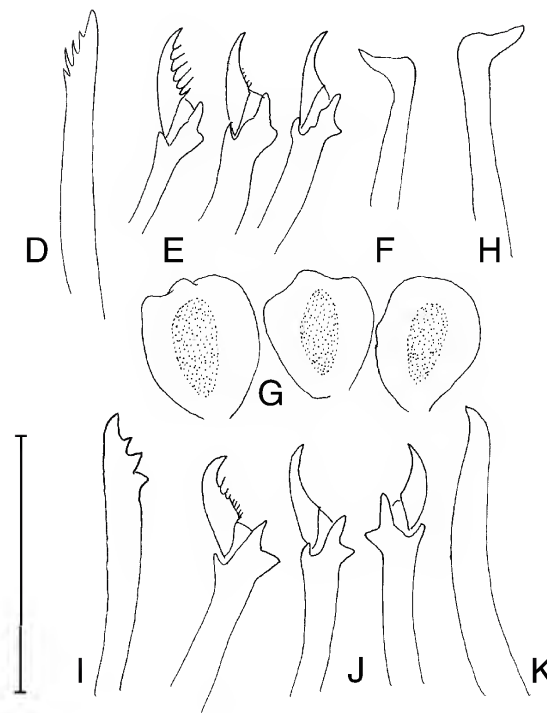


Fig. 43. *Sphaerosyllis bifurcatoides*. (A) anterior end, dorsal view. (B) midbody segment, dorsal view. (C) posterior end, dorsal view. (D) dorsal simple chaeta, anterior parapodium. (E) compound chaetae, anterior parapodium. (F) acicula, anterior parapodium. (G) detail of papillae. (H) acicula, posterior parapodium. (I) dorsal simple chaeta, posterior parapodium. (J) compound chaetae, posterior parapodium. (K) ventral simple chaeta. Scale A–C: 70 μ m, D–K: 20 μ m.

provided with 2 subdistal, rounded papillae (Fig. 44A,C), and sometimes few other basal papillae similar to dorsal papillae (Fig. 44C). Ventral cirri relatively long, slender. Parapodial glands small, difficult to see, with granular material (Fig. 44A,C). Anterior parapodia each with 5 compound chaetae with unidentate blades (Fig. 44D); blades of dorsal compound chaetae with moderate, straight marginal spines, about 12 μ m long, blades of ventral compound chaetae smooth, about 9 μ m long. Number of compound chaetae on each parapodium diminishing posteriorly to 3 on posterior parapodia, with thick shafts provided with strong subdistal spur giving bifurcate appearance, and hooked blades, smooth, provided with a long, distinct subdistal spine on most dorsal compound chaetae (Fig. 44G), about 10–9 μ m long. Dorsal simple chaetae from chaetiger 1, unidentate, with few subdistal marginal spines (Fig. 44F). Ventral simple chaetae on posterior parapodia, sigmoid, distally hooked, unidentate, smooth, provided with a long, distinct subdistal spine (Fig. 44H). Parapodia each with solitary, slender acicula, bent to a right angle (Fig. 44E,I). Pygidium small, with numerous, rounded papillae, and 2 anal cirri, similar to dorsal cirri but much longer (Fig. 44B). Pharynx through 3 segments; pharyngeal tooth not seen; probably located on anterior rim (Fig. 44A). Proventricle through 1–2 segments, with 12 muscle cell rows.

Remarks. This species is closely related to *Sphaerosyllis bifurcata*, *S. bifurcatoides* and *S. rotundipapillata*, all Australian endemic species, all characterized by having large, distinct dorsal papillae, distally rounded or trilobed,

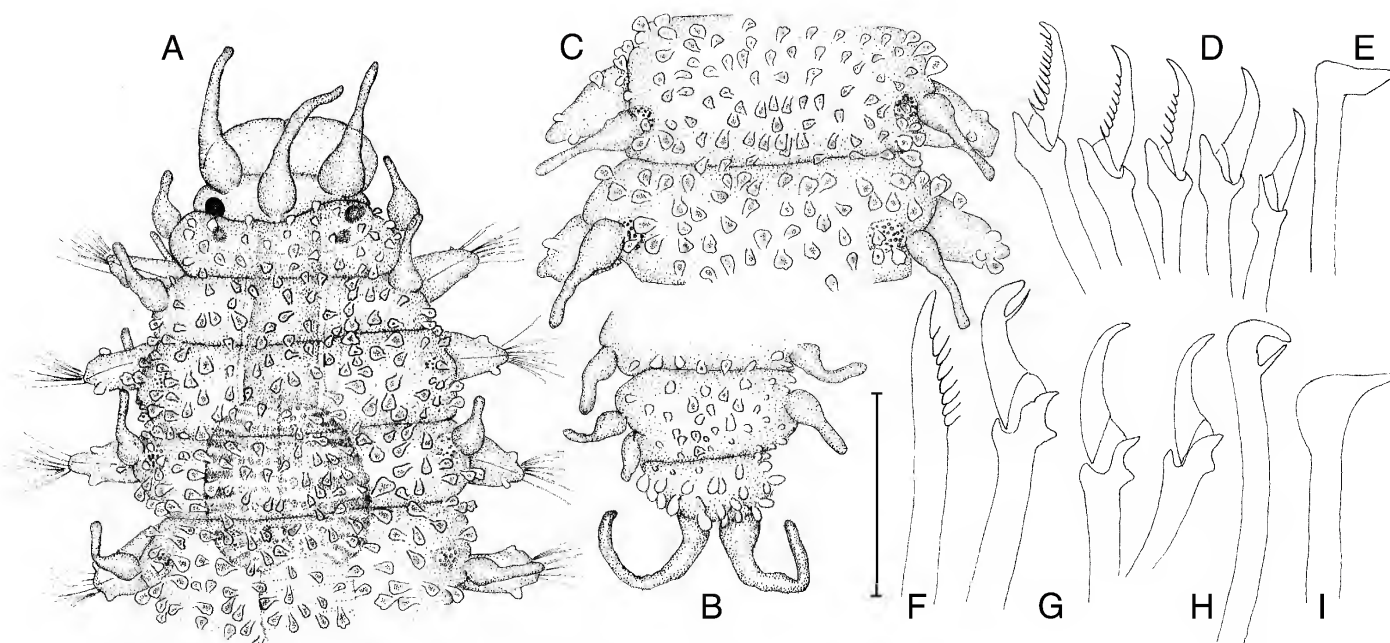


Fig. 44. *Sphaerosyllis voluntariorum* n.sp. (A) anterior end, dorsal view. (B) posterior end, dorsal view. (C) midbody segments, dorsal view. (D) compound chaetae, anterior parapodium. (E) acicula, anterior parapodium. (F) dorsal simple chaeta, posterior parapodium. (G) compound chaetae, posterior parapodium. (H) ventral simple chaeta. (I) acicula, posterior parapodium. Scale A–C: 82 µm, D–H: 28 µm.

and shafts of compound chaetae distally bifid. *Sphaerosyllis voluntariorum* is represented by a single specimen, but it is distinctly different to these three species because it is more densely papillated on anterior segments and by having a long, distinct subdistal spine on the ventral simple chaetae and on the blades of dorsalmost, posterior compound chaetae.

Distribution. Australia (Western Australia).

Habitat. On algae, 2 m depth.

Etymology. This species is dedicated to the volunteers of the Marine Invertebrate section of The Australian Museum, who sorted samples from all around Australia, extracting specimens of syllids for this study.

***Sphaerosyllis bifurcata*
(Hartmann-Schröder, 1979) n.comb.**

Fig. 45A–I

Parapionosyllis bifurcata Hartmann-Schröder, 1979: 96, figs. 105–111; 1991: 35.

Material examined. AUSTRALIA: QUEENSLAND. 1 specimen on SEM stub, AM W26932, Haughton River estuary, near Cunggulla, 19°24'S 147°6'E, tidal flats (mud & sand); mudflat with *Avicennia* mangroves, S. Dittmann, 5 Sep 1991. NEW SOUTH WALES. 4 specimens, AM W26707, 100 m north west of Julian Rocks, Byron Bay, 28°36.8'S 153°37.8'E, shell and gravel, 15 m, E.L. Albertson *et al.*, 3 Mar 1992.

Description. Body small, slender, 3 mm long, 0.17 mm wide, 32 chaetigers. Anterior segments with few papillae

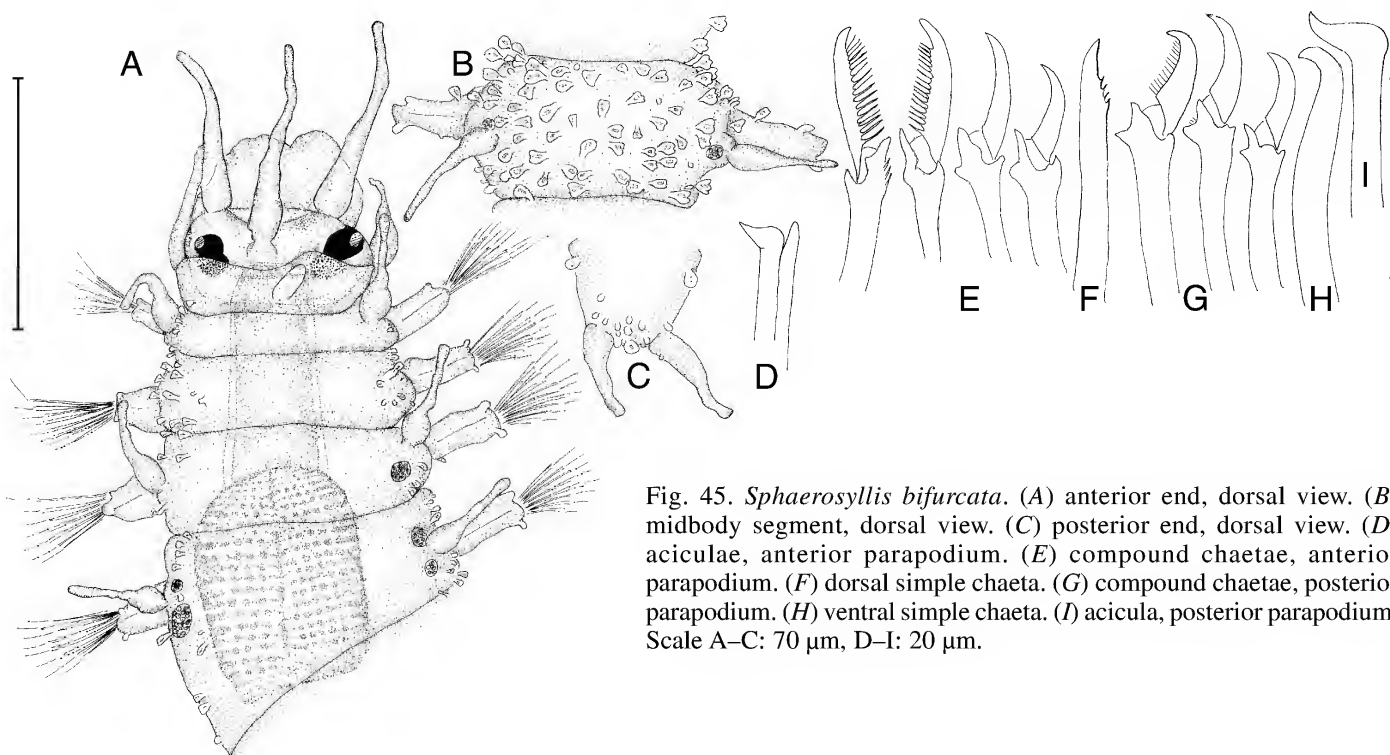


Fig. 45. *Sphaerosyllis bifurcata*. (A) anterior end, dorsal view. (B) midbody segment, dorsal view. (C) posterior end, dorsal view. (D) aciculae, anterior parapodium. (E) compound chaetae, anterior parapodium. (F) dorsal simple chaeta. (G) compound chaetae, posterior parapodium. (H) ventral simple chaeta. (I) acicula, posterior parapodium. Scale A–C: 70 µm, D–I: 20 µm.

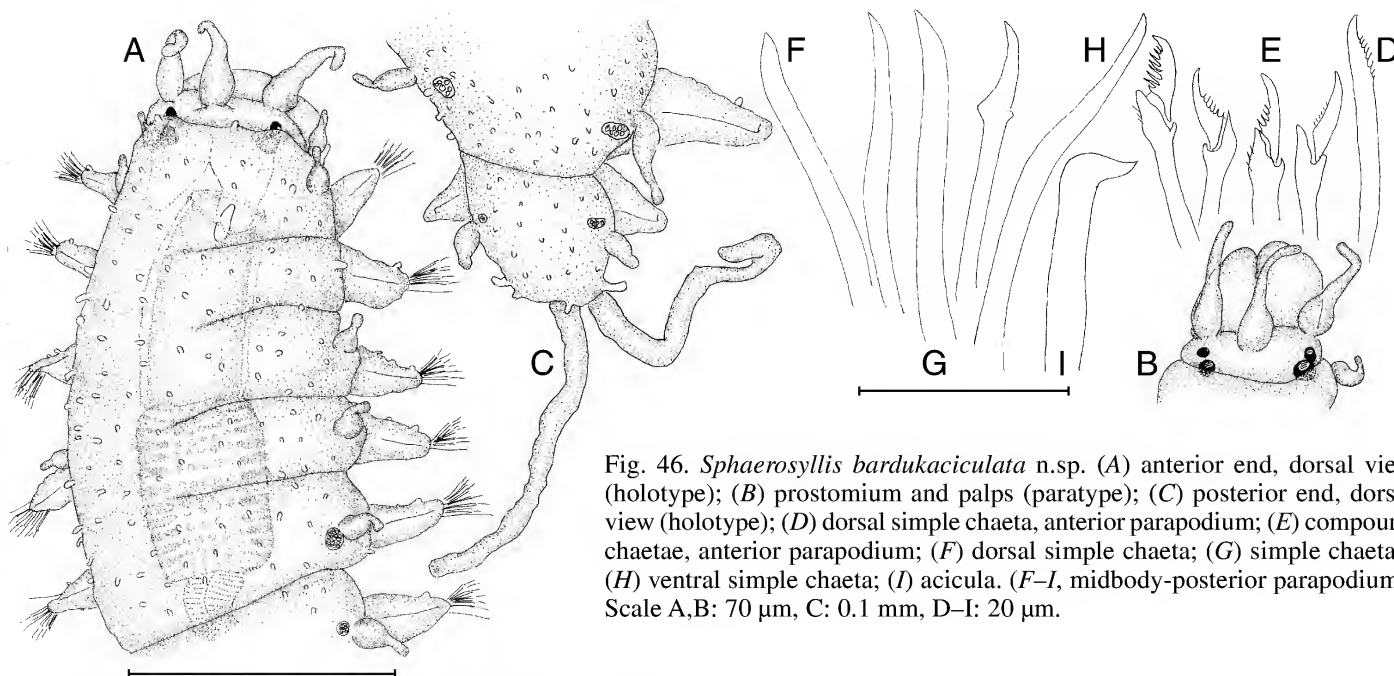


Fig. 46. *Sphaerosyllis bardukaciculata* n.sp. (A) anterior end, dorsal view (holotype); (B) prostomium and palps (paratype); (C) posterior end, dorsal view (holotype); (D) dorsal simple chaeta, anterior parapodium; (E) compound chaetae, anterior parapodium; (F) dorsal simple chaeta; (G) simple chaetae; (H) ventral simple chaeta; (I) acicula. (F–I, midbody-posterior parapodium). Scale A,B: 70 µm, C: 0.1 mm, D–I: 20 µm.

on dorsolateral position (Fig. 45A); from midbody, papillae numerous (Fig. 45B) covering dorsum, few papillae on parapodia; papillae long, distinct, with slender stalk and expanded, rounded or slightly trilobed tips (Fig. 45B), with dark inclusions. Papillae absent on prostomium and palps, scarce on peristomium and anteriormost segments. Prostomium ovate to trapezoidal, wider than long; 4 thick eyes in trapezoidal arrangement. Antennae relatively long, with bulbous bases and long, slender tips, longer than combined length of prostomium and palps (Fig. 45A). Palps similar in length to prostomium, fused all along their length, with distal notch. Peristomium similar in length to following segments, anterior margin slightly bilobed, covering posterior part of prostomium; tentacular cirri relatively long but shorter than antennae. Dorsal cirri relatively long, shorter than tentacular cirri, similar in length to parapodial lobes, with bulbous bases and slender tips (Fig. 45A,B). Parapodial lobes rectangular in dorsal view, provided with 2 distal, rounded papillae (Fig. 45A), and sometimes few other basal papillae similar to dorsal papillae (Fig. 45B). Ventral cirri relatively long, slender. Parapodial glands small, difficult to see, with granular material (Fig. 45A,B). Anterior parapodia each with 6–7 compound chaetae with unidentate blades; shafts thicker ventrally, with a subdistal spur (Fig. 45E); blades of dorsal compound chaetae with long, straight marginal spines, about 16 µm long, blades of ventral compound chaetae smooth, about 12–10 µm long. Number of compound chaetae on each parapodium decreasing posteriorly to 3 on posterior parapodia, with thick shafts provided with strong subdistal spur giving bifurcate appearance, and hooked blades, smooth or provided with short marginal spines (Fig. 45G), about 10 µm long. Dorsal simple chaetae from anterior parapodia, unidentate, with few subdistal marginal spines (Fig. 45F). Ventral simple chaetae on posterior parapodia, sigmoid, distally hooked, unidentate, smooth (Fig. 45H). Anteriormost parapodia each with one slender, straight acicula and another one bent at tip, forming right angle (Fig. 45D); solitary acicula with bent tip, forming right angle in remaining parapodia (Fig. 45I). Pygidium small, with a few rounded papillae and 2 anal cirri, similar to dorsal cirri but slightly thicker (Fig. 45C). Pharynx through 3–4 segments; pharyngeal tooth

relatively long, conical, on anterior rim (Fig. 45A). Proventricle through 2 segments, with 15 muscle cell rows.

Remarks. The aciculae were described as distally rounded in the original description; depending upon the view, the aciculae appear to be rounded in some parapodia, but they have the typical shape of *Sphaerosyllis* in lateral view.

Distribution. Australia (Western Australia, New South Wales, Queensland).

Habitat. Mud, fine to coarse sand, gravel. Intertidal to 15 m depth.

Sphaerosyllis bardukaciculata n.sp.

Fig. 46A–I

Material examined. AUSTRALIA: QUEENSLAND. HOLOTYPE: AM W26712, Halifax Bay, north of Townsville, 19°09'S 146°37'E, 5 m, Queensland Nickel Pty Ltd, July 1985. PARATYPES: 4 specimens, AM W26713, Halifax Bay, north of Townsville, 19°09'S 146°37'E, 5 m, Queensland Nickel Pty Ltd, July 1985. 1 specimen (identified as *Brania opisthodentata*), ZHM P-21030, Heron Island, coarse sand, intertidal, G. Hartmann-Schröder, 4 Feb 1976.

Description. Body small, 2.3 mm long, 0.15 mm wide, 24 chaetigers. Dorsal surface provided with short papillae (Fig. 46A,C). Prostomium ovate, partially covered dorsally by peristomium (Fig. 46A,B), wider than long; 4 eyes in trapezoidal arrangement; antennae longer than prostomium, shorter than combined length of prostomium and palps (Fig. 46A); median antenna inserted in front of anterior eyes, slightly posteriorly to lateral antennae; lateral antennae inserted on anterior margin of prostomium (Fig. 46A,B). Palps fused all along their length, with a dorsal furrow (Fig. 46B). Dorsal cirri short on anterior segments (Fig. 46A), slightly longer on midbody and posterior segments (Fig. 46C), absent on chaetiger 2. Parapodial glands small, with granular material, present from chaetigers 4–5 (Fig. 46A,C). Anterior parapodia each with 3–4 compound chaetae, with short, unidentate blades, provided with moderate to short marginal spines, spines longer on dorsalmost chaetae (Fig. 46E), about 8 µm long, and dorsal simple chaeta, unidentate, with short marginal spines (Fig. 46D); progressively, blades

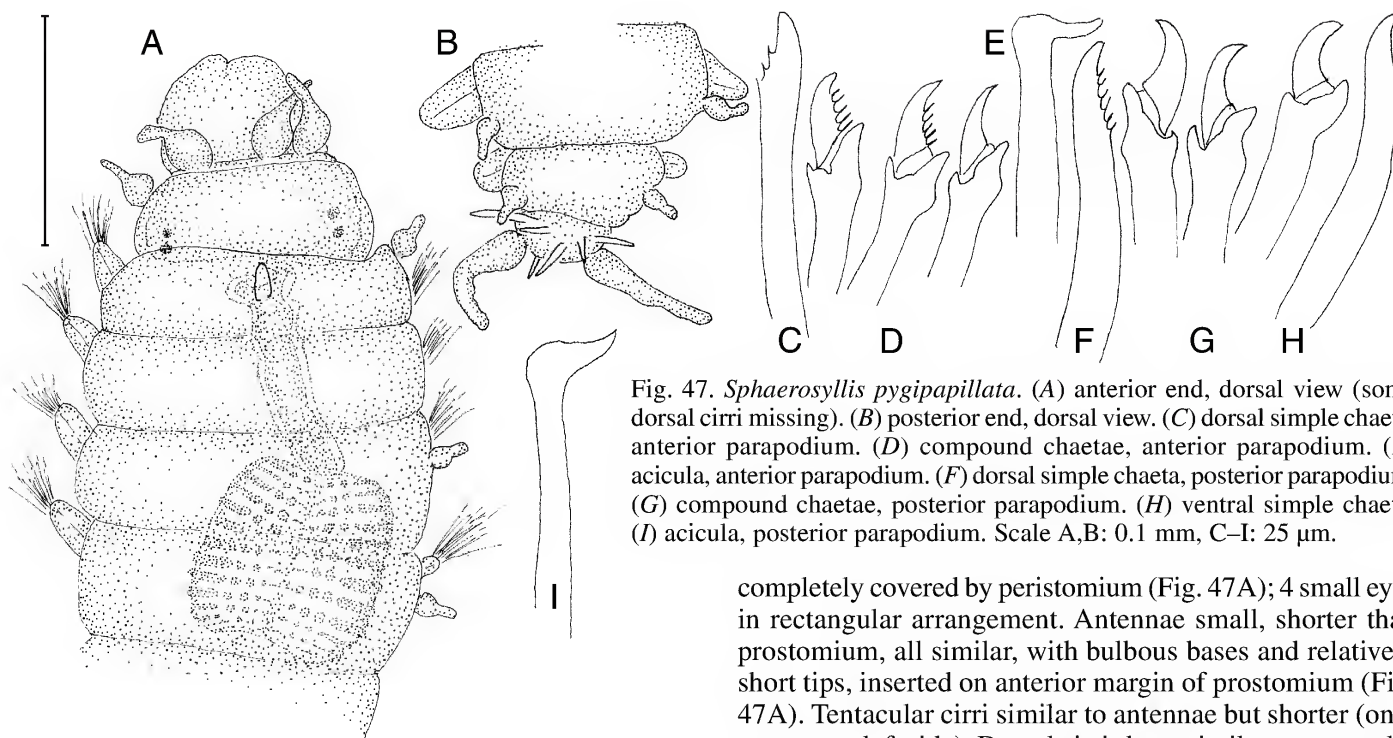


Fig. 47. *Sphaerosyllis pygipapillata*. (A) anterior end, dorsal view (some dorsal cirri missing). (B) posterior end, dorsal view. (C) dorsal simple chaeta, anterior parapodium. (D) compound chaetae, anterior parapodium. (E) acicula, anterior parapodium. (F) dorsal simple chaeta, posterior parapodium. (G) compound chaetae, posterior parapodium. (H) ventral simple chaeta. (I) acicula, posterior parapodium. Scale A,B: 0.1 mm, C–I: 25 µm.

of compound chaetae missing and shafts enlarging, forming thick simple chaetae; from midbody posteriorly, parapodia each with 4 simple chaetae by modification of compound chaetae (Fig. 46G), dorsal (Fig. 46F) and ventral (Fig. 46H) unidentate, smooth, simple chaetae. Acicula solitary, distally bent at right angle (Fig. 46I). Pharynx through about 3 segments (Fig. 46A), pharyngeal tooth relatively long, on anterior margin. Proventricle through 2 segments (Fig. 46A), with 23 muscle cell rows. Pygidium small, provided with relatively long papillae, and 2 long anal cirri (Fig. 46C).

Remarks. *Sphaerosyllis bardukaciculata* n.sp. is similar to *Sphaerosyllis aciculata* Perkins, 1981, from Florida; the chaetae are nearly identical; *S. bardukaciculata*, however, differs from *S. aciculata* in having longer antennae and anal cirri, and parapodial glands with granular material instead of fibrillar material (Perkins, 1981).

Distribution. Australia (Queensland).

Habitat. Coarse sand.

Etymology. The name is derived from the Aboriginal word *barduk*, meaning “near”, referring to its similarity with *S. aciculata*.

***Sphaerosyllis pygipapillata*
Hartmann-Schröder, 1981**

Fig. 47A–I

Sphaerosyllis pygipapillata Hartmann-Schröder, 1981: 38, figs. 73–76.

Material examined. AUSTRALIA: WESTERN AUSTRALIA. HOLOTYPE, HZM 16490, Exmouth, Tantabiddy Creek, intertidal sand, G. Hartmann-Schröder, 11 Oct 1975.

Description. The single known specimen is small, 1.08 mm long, 0.14 mm wide, 19 chaetigers, complete, apparently without papillae on dorsum. Prostomium rectangular,

completely covered by peristomium (Fig. 47A); 4 small eyes in rectangular arrangement. Antennae small, shorter than prostomium, all similar, with bulbous bases and relatively short tips, inserted on anterior margin of prostomium (Fig. 47A). Tentacular cirri similar to antennae but shorter (only present on left side). Dorsal cirri short, similar to tentacular cirri (Fig. 47A). Parapodial glands not seen. Anterior parapodia each with about 4–5 compound chaetae, blades unidentate, provided with short marginal spines or smooth, longer on dorsal chaetae (Fig. 47D), blades all similar and short, about 5 µm long. Progressively posteriorly, number of compound chaetae on each parapodium decreasing to 3 on posterior parapodia, with similar blades, all smooth (Fig. 47G), slightly hooked. Dorsal simple chaetae from chaetiger 1, unidentate, provided with short marginal spines (Fig. 47C,F). Ventral simple chaetae on posterior parapodia, sigmoid, unidentate, smooth (Fig. 47H). Acicula solitary, distally bent at right angle (Fig. 47E,I). Pygidium small, provided with a few long, acute papillae and 2 anal cirri, similar in shape to dorsal cirri but much longer (Fig. 47B). Pharynx slender, through 3 segments (Fig. 47A); pharyngeal tooth anteriorly located. Proventricle small, through 2 segments, with 13 muscle cell rows.

Distribution. Australia (Western Australia).

Habitat. Fine sand, intertidal.

***Sphaerosyllis densopapillata*
Hartmann-Schröder, 1979**

Figs. 48A–H, 49A,B

Sphaerosyllis capensis densopapillata Hartmann-Schröder, 1979: 104, figs. 141–143; 1980: 54; 1981: 36; 1982: 69; 1990: 53. *Sphaerosyllis cuticulata* Hartmann-Schröder, 1991(in part): 41, figs. 68–72.

Material examined. AUSTRALIA: QUEENSLAND. 2 specimens, AM W26566, Halifax Bay, north of Townsville, 19°10'S 146°44'E, 5 m, Queensland Nickel Pty Ltd, July 1977. 2 specimens, AM W26577, Halifax Bay, north of Townsville, 19°10'S 146°44'E, 5 m, Queensland Nickel Pty Ltd, Jan 1977. 1 specimen, AM W26714, 100 m off Mangrove Beach, Lizard Island, 14°40'S 145°28'E, medium sediment, 3 m, C. Short & A.R. Jones, 13 Oct 1978. 2 specimens, AM W26933, Hinchinbrook Channel, 18°20'S 146°4'E, tidal flats (mud & sand), S. Dittmann, 14 Oct 1989. WESTERN AUSTRALIA. 4 specimens, AM W17727, Exmouth, near Tantabiddy Creek, 21°56'S 113°58'E, algae & crusts, G. Hartmann-Schröder, 11 Jan 1975. 1 specimen, AM W26626, off south end of Long

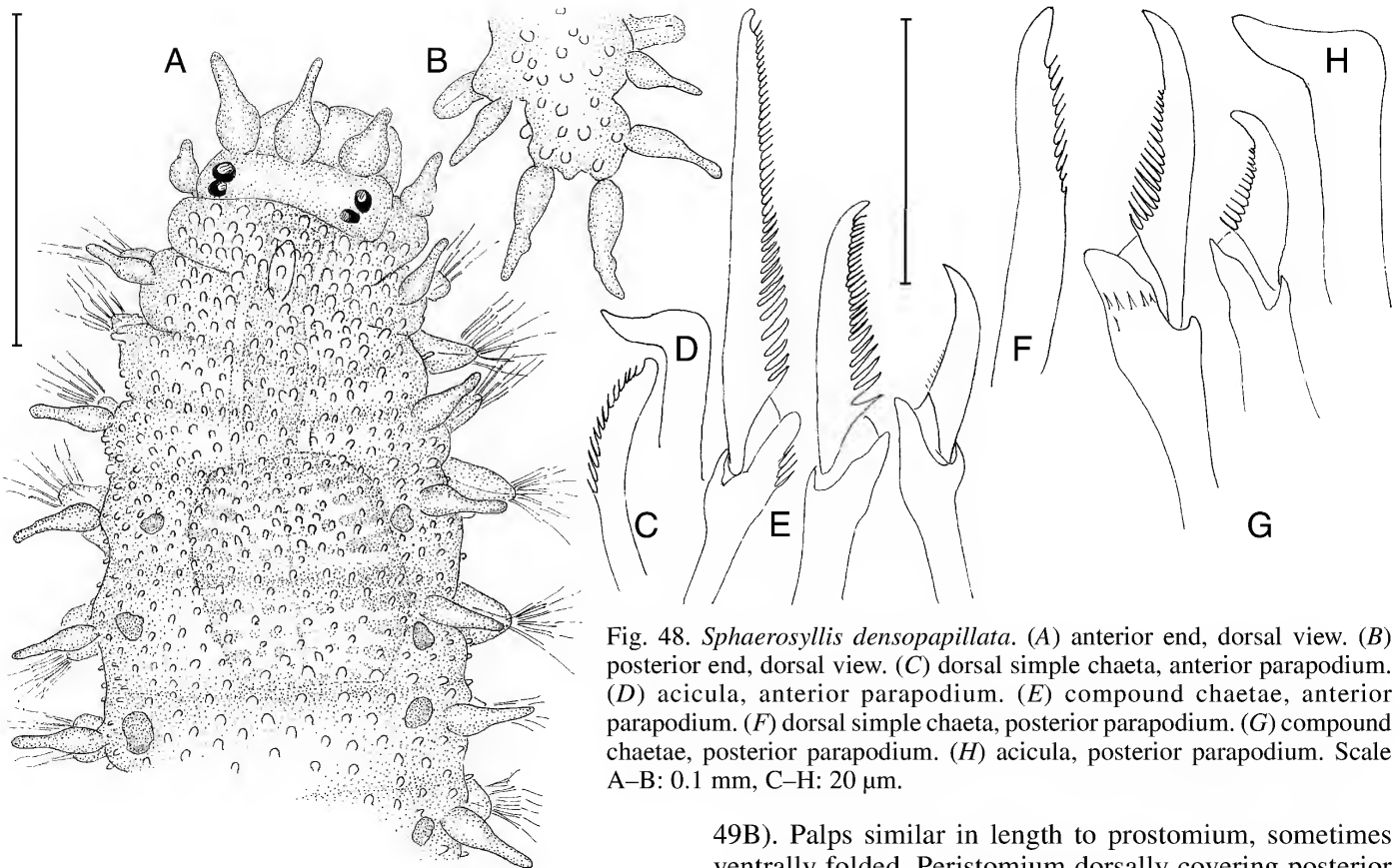


Fig. 48. *Sphaerosyllis densopapillata*. (A) anterior end, dorsal view. (B) posterior end, dorsal view. (C) dorsal simple chaeta, anterior parapodium. (D) acicula, anterior parapodium. (E) compound chaetae, anterior parapodium. (F) dorsal simple chaeta, posterior parapodium. (G) compound chaetae, posterior parapodium. (H) acicula, posterior parapodium. Scale A–B: 0.1 mm, C–H: 20 µm.

Island, Beacon Island, 28°28.8'S 113°46.3'E, dead coral covered in coralline algae, 5 m, P.A. Hutchings, 25 May 1994. 3 specimens, AM W26627, east side of Goss Passage, Beacon Island, 28°25.5'S 113°47.0'E, intertidal; fauna in sand under boulders; very low tide, 0 m, P.A. Hutchings, 24 May 1994. 1 specimen, AM W26628, Goss Passage, Beacon Island, 28°25.5'S 113°47.0'E, dead *Acropora* with coralline algae, sponges & ascidians, 23 m, P.A. Hutchings, 19 May 1994. 7 specimens, AM W26629, north end of Long Island, Goss Passage, 28°28.3'S 113°46.3'E, dead coral covered with coralline algae & boring bivalves, 8 m, C. Bryce, 22 May 1994. 1 specimen, AM W26630, south west corner of Lucas Island, Kimberleys, 15°13'S 124°31'E, 30 m, P.A. Hutchings, 24 July 1988. 46 specimens, AM W26631, north end of Long Island, Goss Passage, 28°27.9'S 113°46.3'E, dead coral covered in coralline algae & brown algae, 6 m, C. Bryce, 22 May 1994. 50 specimens and 6 specimens on SEM stub, AM W27641, north end of beach, Bundegi Reef, Exmouth Gulf, 21°49'S 114°11'E, rocky rubble, brown algae with epiphytes, sediment, 2 m, H.E. Stoddart, 4 Jan 1984. 1 specimen, AM W27647, Lafontaine Island, Kimberley region, 14°10'S 125°47'E, 15 m, P.A. Hutchings, 19 July 1988. 11 specimens, AM W27648, north end of beach, Bundegi Reef, Exmouth Gulf, 21°49'S 114°11'E, rocky rubble, coralline algae with green epiphyte, 2 m, H.E. Stoddart, 4 Jan 1984. 1 specimen, AM W27655, inshore reef off Ned's Camp, Cape Range National Park, 21°59'S 113°59'E, frilly *Caulerpa* sp., 1 m, J.K. Lowry, 2 Jan 1984. 1 specimen, AM W27659, 5 km offshore, Bush Bay, 30 km south of Carnarvon, 25°10'S 113°39'E, airlift in strap-leaved seagrass beds, 2 m, J.K. Lowry & R.T. Springthorpe, 6 Jan 1984.

Additional material. HOLOTYPE. HZM P-20560, Heron Island, G. Hartmann-Schröder.

Description. Body small, relatively short, up to 2.5 mm long, 0.12 mm wide, 26 chaetigers. Dorsal surface provided with numerous, rounded papillae, present from peristomium to pygidium (Figs. 48A,B, 49A,B). Prostomium rectangular; 4 eyes in rectangular to trapezoidal arrangement, close to each other on each side. Antennae inserted on anterior margin of prostomium, all similar or median antenna slightly longer than lateral antennae, all longer than palps, shorter than combined length of prostomium and palps (Figs. 48A,

49B). Palps similar in length to prostomium, sometimes ventrally folded. Peristomium dorsally covering posterior part of prostomium, similar in length to following segments; tentacular cirri slightly shorter than antennae. Dorsal cirri similar to tentacular cirri, slightly elongate (Fig. 48A), especially on far posterior segments (Fig. 48B). Small, indistinct parapodial glands with hyaline to granular material from chaetiger 4 (Fig. 48A), difficult to see. Anterior parapodia each with about 6 compound chaetae, numbers declining posteriorly to 3 on posterior parapodia; strong dorsoventral gradation in length of blades, especially on anterior segments, 36 µm above 16 µm below (Fig. 48E), less marked on posterior parapodia, 24 µm above 14 µm below (Fig. 48G); longer blades provided with long marginal spines basally, spines shorter on ventral and posterior chaetae. Dorsal simple chaetae from anterior parapodia, curved, unidentate, provided with short marginal spines (Fig. 48C), slightly thicker on posterior parapodia (Fig. 48F). Ventral simple chaetae on posterior parapodia, sigmoid, smooth, unidentate. Acicula solitary, distally bent at right angle (Fig. 48D), thicker posteriorly (Fig. 48H). Pharynx through 3–4 segments; pharyngeal tooth relatively long (Fig. 48A). Proventricle small, through 2 segments, with 13–14 muscle cell rows. Pygidium small, with two anal cirri similar to dorsal cirri but longer (Fig. 48B).

Remarks. *Sphaerosyllis densopapillata*, originally described as a subspecies of *S. capensis*, is similar to *S. magnidentata* Perkins, 1981 from Florida, Bahamas, Cuba, Belize, and the Canary Islands. Both species have a similar size, arrangement of antennae, parapodial glands small, with hyaline contents, and a large pharyngeal tooth (see Perkins, 1981; Russell, 1991; Núñez *et al.*, 1992). *Sphaerosyllis densopapillata*, however, has many more dorsal papillae; juvenile specimens have a less densely papillated dorsum, and the papillae are more difficult to see on specimens covered by a dense coat of detritus. I have examined the holotype and 11 paratypes of the species *S. cuticulata*

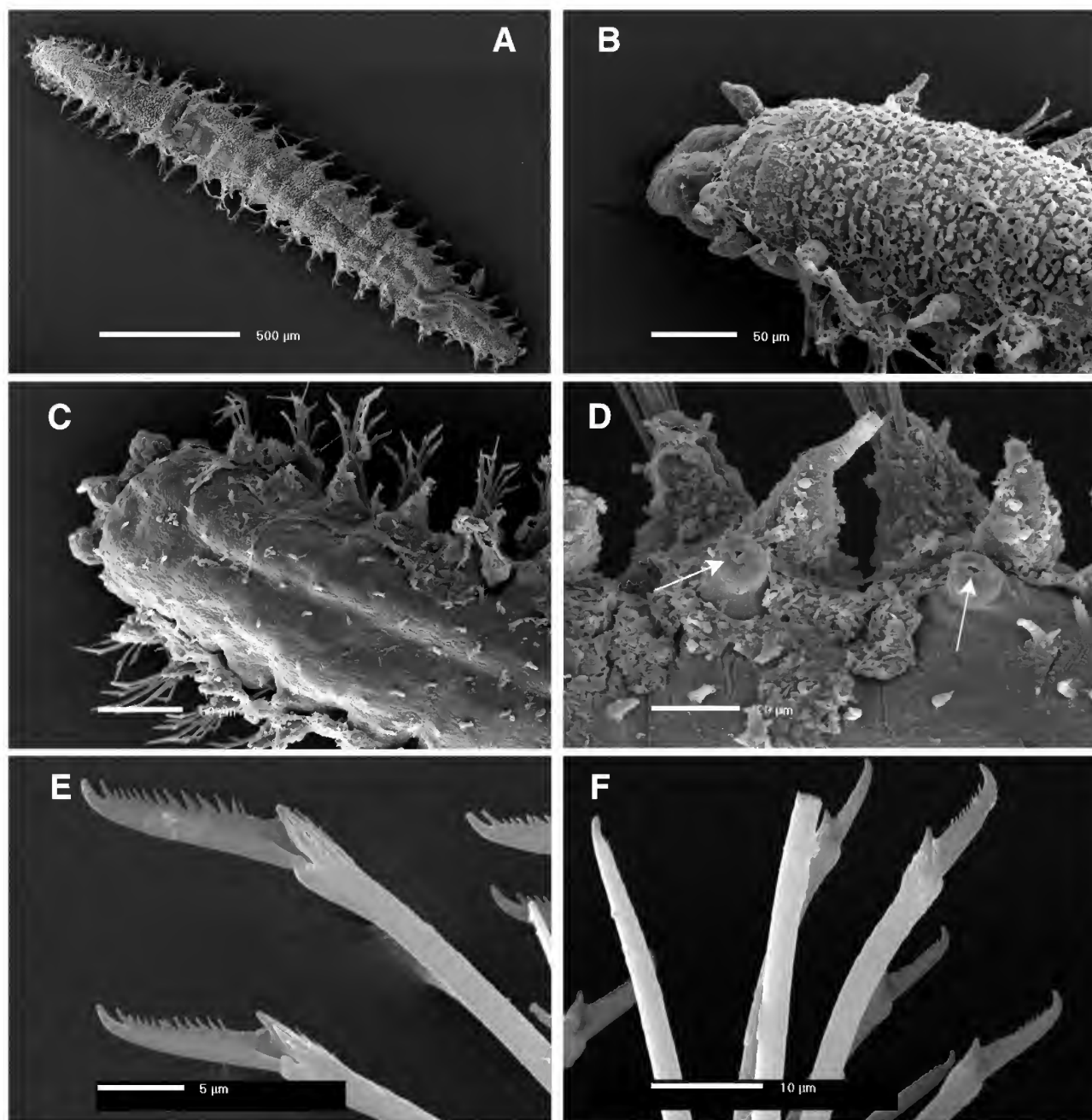


Fig. 49. SEM of *Sphaerosyllis densopapillata*. (A) dorsal view, mature male with natatory chaetae. (B) anterior end, dorsal view. SEM of *Sphaerosyllis capensis*. (C) anterior end, dorsal view. (D) midbody parapodia. (E) anterior compound chaetae. (F) chaetal bundle.

Hartmann-Schröder, 1991; the holotype appears to be a juvenile specimen of *S. densopapillata*, with less papillated dorsum than the larger specimens; the paratypes belong to *S. capensis* (see below).

Distribution. Australia (Western Australia, Queensland, New South Wales).

Habitat. Sand, from fine to coarse. Amongst algae, inside corals and coralline algae. Intertidal to about 30 m depth.

Sphaerosyllis capensis Day, 1953

Figs. 49C–F, 50A–I

Sphaerosyllis hystrix var. *capensis* Day, 1953: 420, fig. g–l.
Sphaerosyllis capensis.—Day, 1967: 276, fig. 12.II.g–j; Hartmann-Schröder, 1974a: 133, pl. 12, figs. 111–115.
Sphaerosyllis cuticulata Hartmann-Schröder, 1991 (in part): 41.

Material examined. AUSTRALIA: WESTERN AUSTRALIA. 2 specimens, AM W26798, Goss Passage, Beacon Island, 28°25.5'S 113°47.0'E, dead plates of *Acropora*, covered in coralline algae, 8 m, P.A. Hutchings, 19 May 1994. 1 specimen, AM W27657, Red Bluff, Kalbarri, 27°42'S 114°09'E, mixed coralline algae from rocky shore, 4 m, J.K. Lowry, 10 Jan 1984. 1 specimen, and 2 specimens on SEM stub, AM W27658, limestone reef, off Ned's camp, Cape Range National Park, 21°59'S 113°55'E, sponge with epiphytic algae, and muddy worm tubes, 1.5 m, R.T. Springthorpe, 2 Jan 1984.

Additional material. 11 paratypes of *Sphaerosyllis cuticulata*, HZM P-20560, Heron Island, G. Hartmann-Schröder.

Description. Body small, short, 1.7 mm long, 0.14 mm wide, 18 chaetigers, dorsum sparsely covered with small papillae, extending to palps and parapodia (Figs. 49C,D, 50A,B). Prostomium rectangular, mostly covered by peristomium (Fig. 49C, 50A); 4 eyes in trapezoidal arrangement. Antennae similar in length to prostomium or

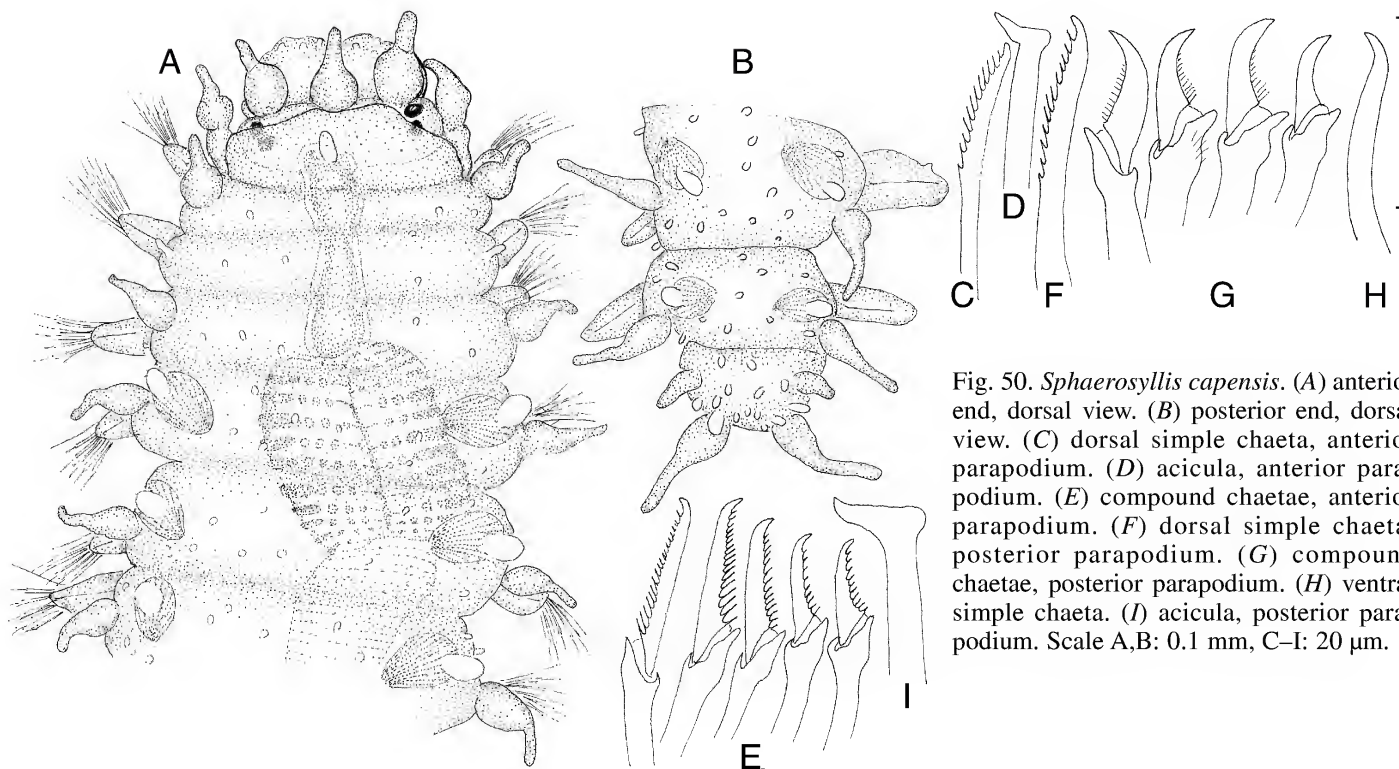


Fig. 50. *Sphaerosyllis capensis*. (A) anterior end, dorsal view. (B) posterior end, dorsal view. (C) dorsal simple chaeta, anterior parapodium. (D) acicula, anterior parapodium. (E) compound chaetae, anterior parapodium. (F) dorsal simple chaeta, posterior parapodium. (G) compound chaetae, posterior parapodium. (H) ventral simple chaeta. (I) acicula, posterior parapodium. Scale A,B: 0.1 mm, C–I: 20 µm.

slightly longer, all similar, with bulbous bases and moderate tips, inserted on anterior margin of prostomium, just in front of anterior eyes (Figs. 49C, 50A). Tentacular cirri similar to antennae but shorter. Dorsal cirri short, similar to tentacular cirri (Fig. 50A), slightly elongate from midbody (Figs. 49D, 50B). Parapodial glands from chaetiger 4, large, distinct, with fibrillar material (Fig. 50A), provided each with a distinct large dorsal papilla longer than all other papillae (Fig. 50A,B), opening by a pore (Fig. 49D). Anterior parapodia each with about 7–8 compound chaetae, blades unidentate, provided with moderately long marginal spines, longer on dorsal chaetae (Fig. 50E), with a subdistal spine longer than others (Fig. 49E), and marked dorsoventral gradation in length, about 23 µm above, 13 µm below. Progressively posteriorly number of compound chaetae on each parapodium decreasing to 5–6, with larger shafts and shorter blades, about 15–13 µm long, slightly hooked, smooth or provided with short marginal spines (Figs. 49F, 50G). Dorsal simple chaetae from chaetiger 1, unidentate, provided with moderately long marginal spines (Fig. 50C,F). Ventral simple chaetae on posterior parapodia, sigmoid, unidentate, smooth (Fig. 50H). Acicula solitary, with tips bent at right angle (Fig. 50D,I). Pygidium small, provided with few papillae and 2 anal cirri, similar in shape to dorsal cirri but longer. Pharynx slender, through 3 segments; pharyngeal tooth anteriorly located. Proventricle small, through 2 segments, with 14 muscle cell rows.

Remarks. *Sphaerosyllis hystrix* from European coasts is similar, but the median antenna is inserted more posteriorly and the compound chaetae of anterior parapodia have longer blades with more marked dorsoventral gradation in length (San Martín, 1984a, 2003). *Sphaerosyllis taylori* Perkins, 1981, from the Atlantic coasts of North America, Caribbean Sea, Canary Islands, and the Mediterranean, also has a less marked gradation in length of blades, parapodial glands with fibrillar material, but the median antenna is inserted more posteriorly than in *S. capensis* and the blades are shorter (Perkins, 1981; San Martín, 1984a, 2003). The paratypes

of *S. cuticulata* agrees with the above described specimens, except for the antennae, which are slightly longer, but I consider them as belonging to the same species.

Distribution. South Africa, Angola and Mozambique. Red Sea. Australia (Western Australia, Queensland).

Habitat. In muddy sand, coralline algae, and dead coral, in shallow waters.

Sphaerosyllis goorabantennata n.sp.

Fig. 51A–H

Material examined. AUSTRALIA: WESTERN AUSTRALIA. HOLOTYPE: AM W26622, north end of Long Island, Goss Passage, 28°27.9'S 113°46.3'E, dead coral covered in coralline algae & brown algae, 6 m, C. Bryce, 22 May 1994. PARATYPES: 2 specimens, AM W26623, north east entrance to Goss Passage, Beacon Island, 28°27.9'S 113°46.7'E, dead *Acropora*, coralline & brown algae on coral substrate, 24 m, P.A. Hutchings, 25 May 1994.

Description. Body small, slender, 2.5 mm long, 0.11 mm wide, 26 chaetigers; papillae small, few, those of lateral side longer, especially on chaetiger 2 (Fig. 51A). Prostomium rectangular, wide; 4 small eyes in trapezoidal arrangement. Antennae proportionally long, distinctly longer than combined length of prostomium and palps, with bulbous bases and long, slender, filiform tips (Fig. 51A). Palps blunt, longer than prostomium, fused along their length, with a dorsal furrow and few papillae. Peristomium similar in length to following segments; tentacular cirri long, shorter than antennae. Dorsal cirri similar to those of other species of genus, with a bulbous bases and slender, short tips; shorter than tentacular cirri (Fig. 51A), slightly elongate on posterior parapodia (Fig. 51D). Anterior parapodia each with 5–6 compound chaetae, with unidentate blades, provided with moderate to short marginal spines (Fig. 51C), and dorsoventral gradation in length, 26 µm above, 14 µm below. Posterior parapodia each with 4 compound chaetae, with blades unidentate, provided with short marginal spines,

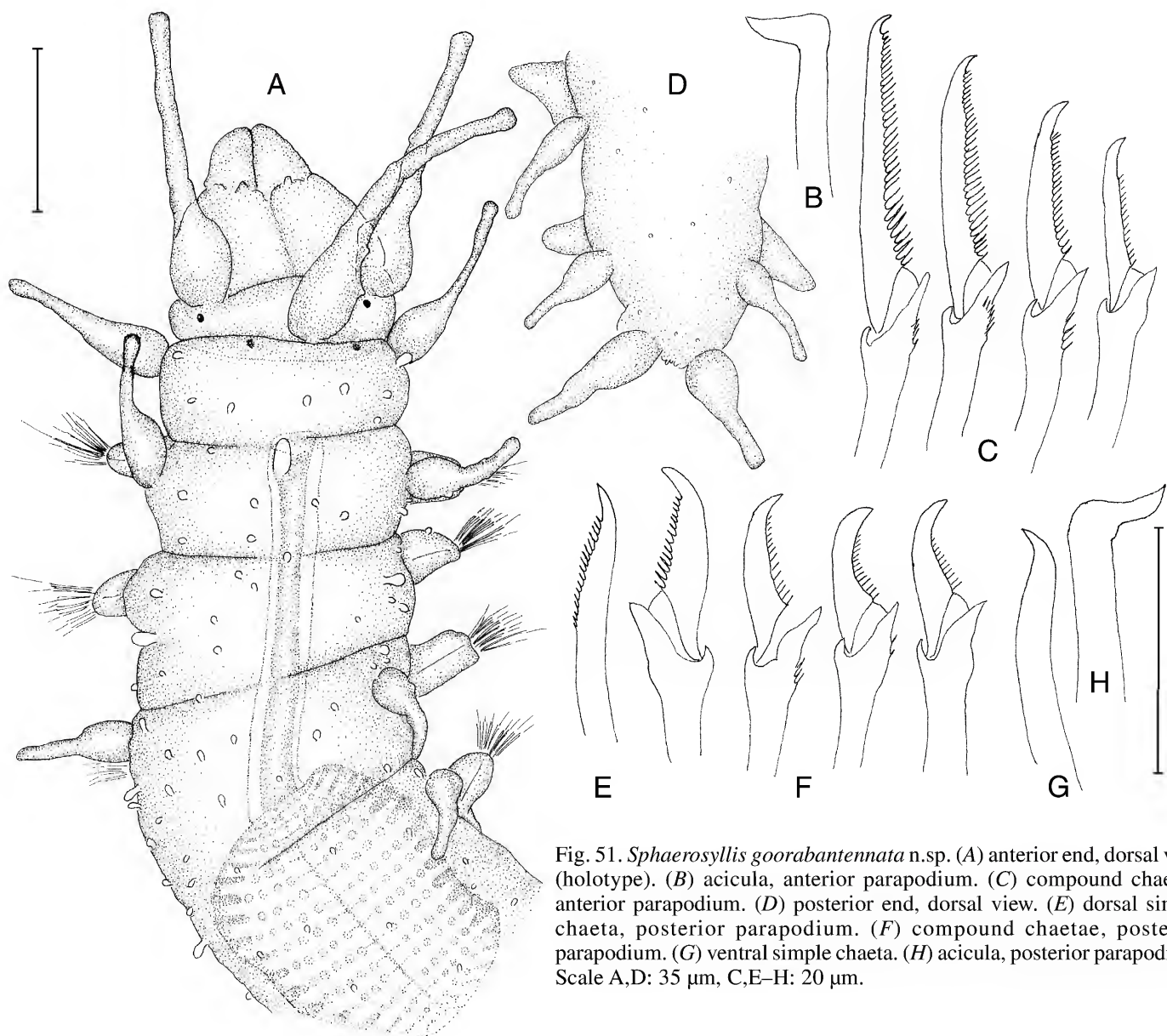


Fig. 51. *Sphaerosyllis goorabantennata* n.sp. (A) anterior end, dorsal view (holotype). (B) acicula, anterior parapodium. (C) compound chaetae, anterior parapodium. (D) posterior end, dorsal view. (E) dorsal simple chaeta, posterior parapodium. (F) compound chaetae, posterior parapodium. (G) ventral simple chaeta. (H) acicula, posterior parapodium. Scale A, D: 35 µm, C, E–H: 20 µm.

slightly hooked, and slight dorsoventral gradation in length, about 16–12 µm long (Fig. 51F). Dorsal simple chaetae from proventricular segments, unidentate, provided with short marginal spines (Fig. 51E). Ventral simple chaetae on posterior parapodia, sigmoid, smooth, unidentate (Fig. 51G). Acicula solitary, bent at right angle (Fig. 51B, H). Parapodial glands not seen. Pygidium small, with a few small papillae and 2 anal cirri similar to dorsal cirri but longer (Fig. 51D). Pharynx slender, through 3 segments (Fig. 51A). Proventricle through 1–2 segments, with 15 muscle cell rows.

Remarks. *Sphaerosyllis goorabantennata* n.sp. is characterized by its small size, small scattered papillae, and distinctly long antennae and tentacular cirri, differing from all other species of the genus in these characters. *Sphaerosyllis minima* Hartmann-Schröder, 1960 and *S. minima magnapapillata* Hartmann-Schröder, 1974 are also small, but the antennae and tentacular cirri are much shorter, similar to all other species of the genus (Hartmann-Schröder, 1960; 1974a).

Distribution. Australia (Western Australia).

Habitat. In dead corals, 6–24 m depth.

Etymology. From the Aboriginal word *gooraba* meaning big, in reference to the long antennae, characteristic of the species.

Sphaerosyllis lateropapillata Hartmann-Schröder, 1986

Figs. 52A–I, 53A–C

Sphaerosyllis capensis lateropapillata Hartmann-Schröder, 1986: 44, figs. 22–28.

Sphaerosyllis (Sphaerosyllis) capensis lateropapillata.–Hartmann-Schröder, 1987: 40.

Sphaerosyllis lateropapillata lateropapillata.–Hartmann-Schröder & Rosenfeldt, 1988: 43; Hartmann-Schröder, 1989: 29, figs. 34–36; 1990: 54.

Material examined. AUSTRALIA: NEW SOUTH WALES. 1 specimen, AM W26479, east of Malabar, Sydney, 34°03.20'S 151°14.60'E, 76.4 m, Fisheries Research Institute, 21 Jun 1996. 1 specimen, AM W26706, North Ledge, Cook Island, 28°11.44'S 153°34.67'E, sponge, 10 m, A.R. Parker, 08 Jun 1993. 3 specimens, AM W26791, Lafontaine Island, Kimberley region, 14°10'S 125°47'E, 15 m, P.A. Hutchings, 19 July 1988. WESTERN AUSTRALIA. 2 specimens, AM W27121, Goss Passage, Beacon Island, 28°25.5'S 113°47.0'E, dead coral plates covered in coralline algae, 8 m, P.A. Hutchings, 22 May 1994. 15 specimens and 2 specimens on SEM stub, AM W27646, north end of beach, Bundegi Reef, Exmouth Gulf, 21°49'S 114°11'E, rocky rubble, brown algae with epiphytes, sediment, 2 m, H.E. Stoddart, 4 Jan 1984. 1 specimen, AM W27649,

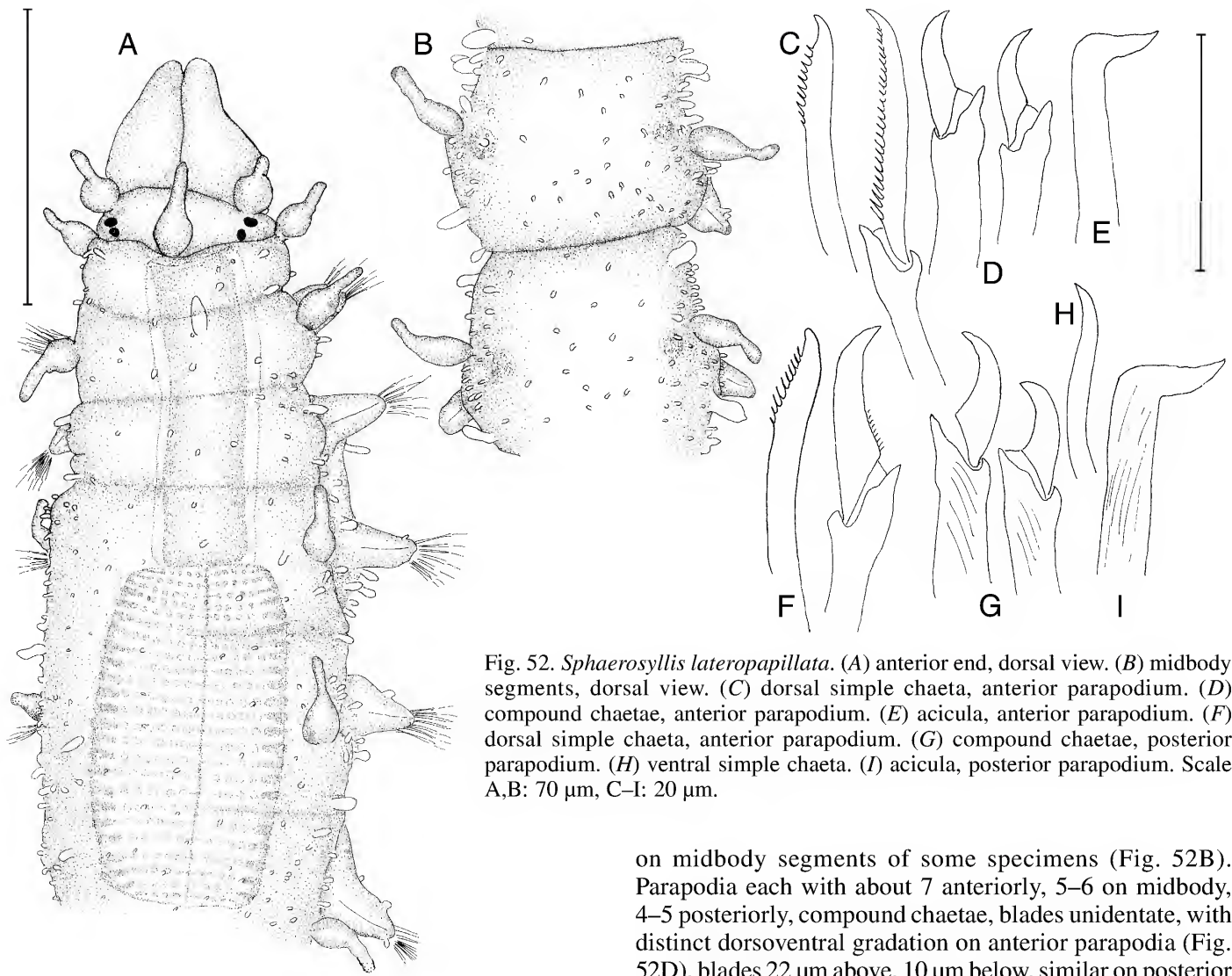


Fig. 52. *Sphaerosyllis lateropapillata*. (A) anterior end, dorsal view. (B) midbody segments, dorsal view. (C) dorsal simple chaeta, anterior parapodium. (D) compound chaetae, anterior parapodium. (E) acicula, anterior parapodium. (F) dorsal simple chaeta, anterior parapodium. (G) compound chaetae, posterior parapodium. (H) ventral simple chaeta. (I) acicula, posterior parapodium. Scale A,B: 70 μ m, C–I: 20 μ m.

north end of beach, Bundegi Reef, Exmouth Gulf, 21°49'S 114°11'E, rocky rubble, coralline algae with green epiphyte, 2 m, H.E. Stoddart, 4 Jan 1984. 1 specimen, AM W27660, 5 km offshore, Bush Bay, 30 km south of Carnarvon, 25°10'S 113°39'E, airlift in strap-leaved seagrass beds, 2 m, J.K. Lowry & R.T. Springthorpe, 6 Jan 1984. 1 specimen, AM W27663, Red Bluff, Kalbarri, 27°42'S 114°09'E, mixed brown algae from rocky shore, 4 m, R.T. Springthorpe, 10 Jan 1984.

Description. Body relatively long and slender, 4.2 mm long, 0.17 mm wide, 40 chaetigers. Dorsal surface provided with scattered small papillae, more abundant and slightly longer on lateral edges on each segment; a few, usually 1–2, longer, oval papillae on anterior and posterior part of each segment on each lateral side of middle segments (Figs. 52A,B, 53B,C). Prostomium oval to rectangular, 4 eyes in trapezoidal arrangement. Antennae shorter than combined length of prostomium and palps when palps extended (Fig. 52A), slightly longer when palps ventrally folded (Fig. 53A); median antenna inserted on posterior margin of prostomium, lateral antennae inserted in front of anterior eyes, on anterior margin of prostomium (Fig. 52A). Palps triangular, longer than prostomium, sometimes ventrally folded, fused along their length, with distinct dorsal furrow. Peristomium similar in length to following segments, covering posterior part of prostomium (Fig. 52A); tentacular cirri similar or shorter than antennae. Dorsal cirri similar to antennae and tentacular cirri (Fig. 52A, 53A), slightly elongate on midbody segments (Figs. 52B, 53B). Parapodial glands with granular material, difficult to see, only visible

on midbody segments of some specimens (Fig. 52B). Parapodia each with about 7 anteriorly, 5–6 on midbody, 4–5 posteriorly, compound chaetae, blades unidentate, with distinct dorsoventral gradation on anterior parapodia (Fig. 52D), blades 22 μ m above, 10 μ m below, similar on posterior parapodia (Fig. 52G), 18–10 μ m long; longer blades with short marginal spines, short blades smooth, slightly hooked. Dorsal simple chaetae from anterior parapodia, unidentate, with short marginal spines, similar throughout (Fig. 52C,F). Ventral simple chaetae on posterior parapodia, sigmoid, unidentate, smooth (Fig. 52H). Acicula solitary, distally bent at right angle (Fig. 52E), slightly larger posteriorly (Fig. 52I). Pharynx through 4 segments; pharyngeal tooth slightly posteriorly from anterior rim (Fig. 52A). Proventricle relatively long, through 2–3 segments, with 20 muscle cell rows.

Distribution. Australia (South Australia, Victoria, New South Wales, Western Australia). Antarctica.

Habitat. Amongst algae, in sponges and dead corals. Intertidal to about 76 m depth.

Sphaerosyllis georgeharrisoni n.sp.

Figs. 53D–F, 54A–H

Material examined AUSTRALIA: WESTERN AUSTRALIA. HOLOTYPE, AM W28657, Goss Passage, Beacon Island, 28°25.5'S 113°47.0'E, dead coral plates covered in coralline algae, 8 m, P. Hutchings, 22 May 1994. PARATYPE, 1 specimen, AM W27123, Goss Passage, Beacon Island, 28°25.5'S 113°47.0'E, dead coral plates covered in coralline algae, 8 m, P. Hutchings, 22 May 1994. PARATYPE, 1 specimen, AM W27128, northeast entrance to Goss Passage, Beacon Island, 28°27.9'S 113°46.7'E, dead plate-like *Acropora* covered in coralline algae, 8 m, P. Hutchings, 25 May 1994. PARATYPE, 1 specimen, AM W28658, off south end of Long Island, Beacon Island, 28°28.8'S 113°46.3'E, dead coral substrate

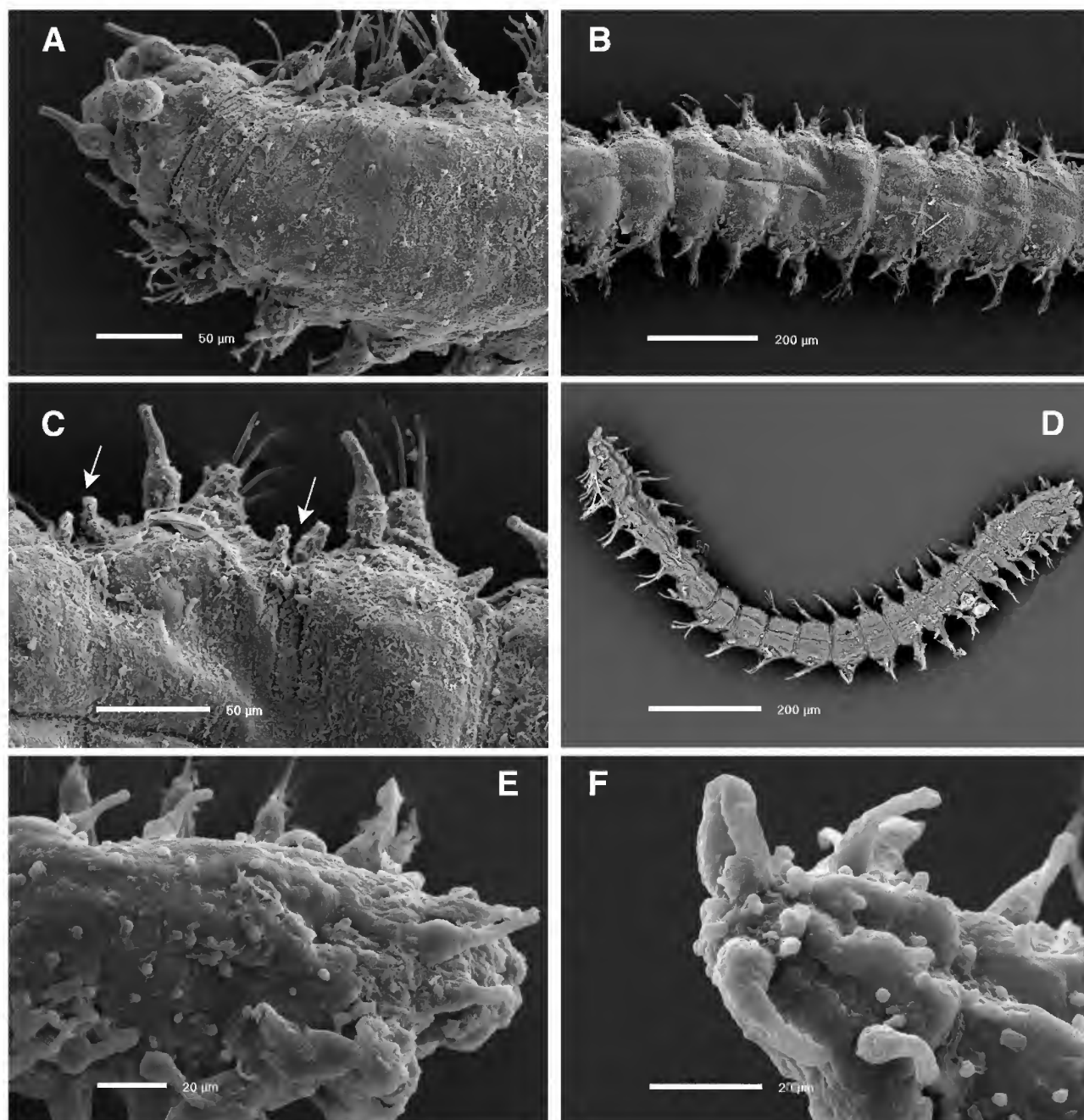


Fig. 53. SEM of *Sphaerosyllis lateropapillata*. (A) anterior end, dorsal view. (B) midbody, dorsal view. (C) midbody parapodia, dorsal view. SEM of *Sphaerosyllis georgeharrisoni*. (D) dorsal view of a complete specimen. (E) anterior end, dorsal view. (F) posterior end, dorsal view.

covered in coralline algae, 5 m, P. Hutchings, 25 May 1994. 2 specimens, AM W27122, Goss Passage, Beacon Island, 28°25.5'S 113°47.0'E, dead *Acropora* plates covered in coralline algae, 8 m, P. Hutchings, 19 May 1994. 22 specimens, AM W27124, north end of Long Island, Goss Passage, 28°28.3'S 113°46.3'E, dead coral covered with coralline algae & boring bivalves, 8 m, C. Bryce, 22 May 1994. 4 specimens, AM W27125, north end of Long Island, 28°27.9'S 113°46.3'E, dead coral substrate with coralline & brown algae, 6 m, C. Bryce, 22 May 1994. 5 specimens, AM W27126, off jetty near Fisheries Hut, Beacon Island, 28°25.5'S 113°47.0'E, dead plate-coral substrate—*Acropora*, *Montipora* spp., 12 m, P. Hutchings, 23 May 1994. 1 specimen, AM W27127, West Deacon Island, 28°28.6'S 113°48.4'E, attached to dead coral, 7 m, A. Brearley, 21 May 1994. 3 specimens, AM W27129, off south end of Long Island, Beacon Island, 28°28.8'S 113°46.3'E, dead coral substrate covered in coralline algae, 5 m, P. Hutchings, 25 May 1994. 1 specimen on SEM stub, AM W27677, 5 km offshore, Bush Bay, 30 km south of Carnarvon, 25°10'S 113°39'E, airlift in strap-leaved seagrass beds, 2 m, J.K. Lowry and R.T. Springthorpe, 6 Jan 1984.

Description. Body small, slender (Fig. 53D), 2.3 mm long, 0.12 mm wide, 26 chaetigers; dorsum covered with small

papillae, extended to palps and parapodia, numerous on midbody (Fig. 54A). Prostomium rectangular, mostly covered by peristomium (Figs. 53E, 54A); 4 eyes in trapezoidal arrangement. Antennae similar in length to prostomium or slightly shorter, all similar, with bulbous bases and moderate tip; lateral antennae inserted on anterior margin, median antenna inserted slightly posteriorly (Fig. 53E), just in front of anterior eyes (Fig. 54A). Tentacular cirri similar to antennae but shorter. Dorsal cirri short, similar to tentacular cirri (Figs. 53E, 54A). Parapodial glands large, with granular or hyaline material, usually both kinds of material in the same specimen (Fig. 54A); some specimens with parapodial glands difficult to see. Anterior parapodia each with about 5 compound chaetae, blades unidentate, provided with moderately long marginal spines, longer on dorsal chaetae (Fig. 54C), with marked dorsoventral gradation in length, about 20 µm above, 10 µm below. Posteriorly, number of compound chaetae on each parapodium decreasing to 3 on posterior parapodia, with larger

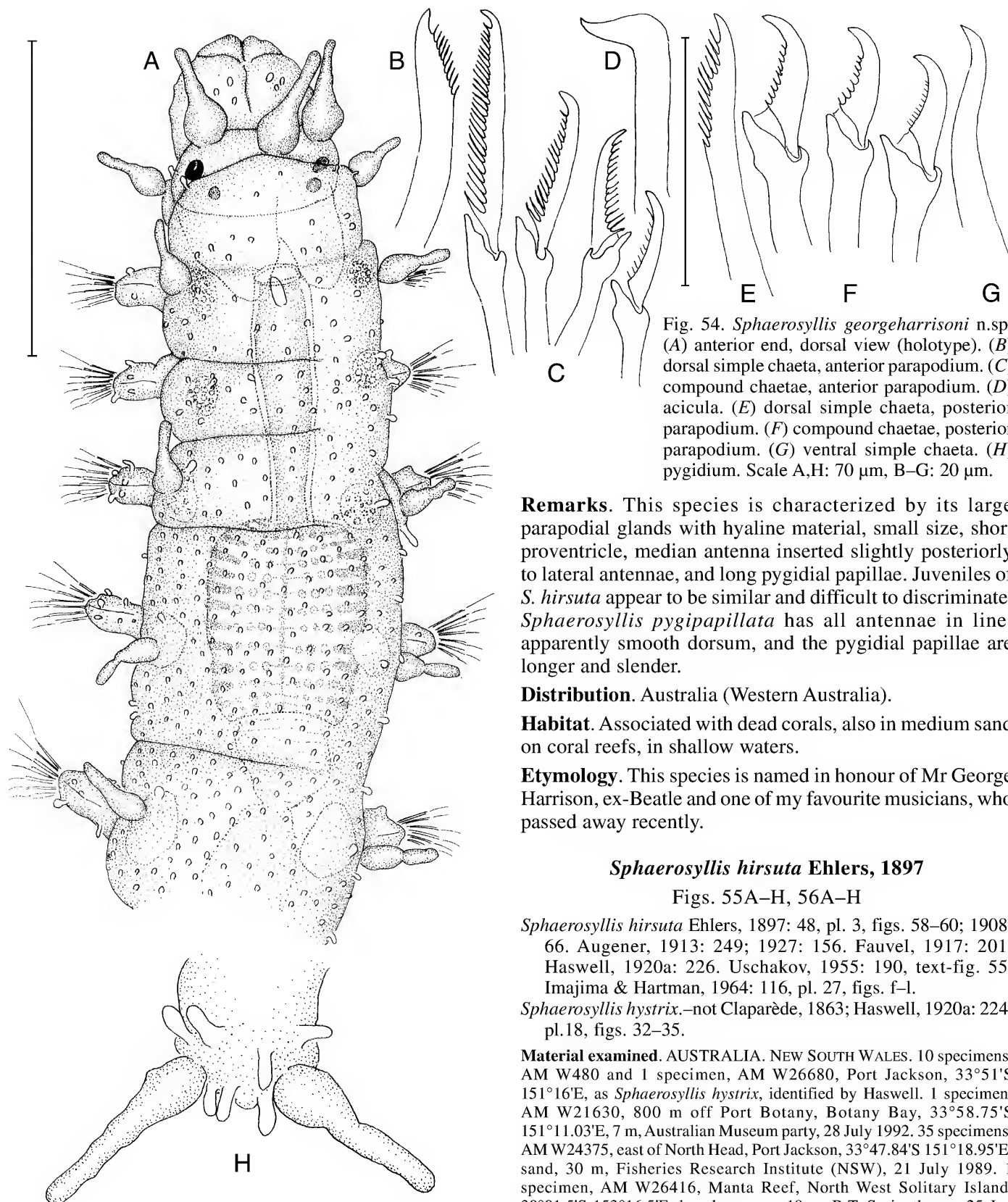


Fig. 54. *Sphaerosyllis georgeharrisoni* n.sp. (A) anterior end, dorsal view (holotype). (B) dorsal simple chaeta, anterior parapodium. (C) compound chaetae, anterior parapodium. (D) acicula. (E) dorsal simple chaeta, posterior parapodium. (F) compound chaetae, posterior parapodium. (G) ventral simple chaeta. (H) pygidium. Scale A,H: 70 µm, B-G: 20 µm.

Remarks. This species is characterized by its large parapodial glands with hyaline material, small size, short proventricle, median antenna inserted slightly posteriorly to lateral antennae, and long pygidial papillae. Juveniles of *S. hirsuta* appear to be similar and difficult to discriminate. *Sphaerosyllis pygipapillata* has all antennae in line, apparently smooth dorsum, and the pygidial papillae are longer and slender.

Distribution. Australia (Western Australia).

Habitat. Associated with dead corals, also in medium sand on coral reefs, in shallow waters.

Etymology. This species is named in honour of Mr George Harrison, ex-Beatle and one of my favourite musicians, who passed away recently.

Sphaerosyllis hirsuta Ehlers, 1897

Figs. 55A–H, 56A–H

Sphaerosyllis hirsuta Ehlers, 1897: 48, pl. 3, figs. 58–60; 1908: 66. Augener, 1913: 249; 1927: 156. Fauvel, 1917: 201. Haswell, 1920a: 226. Uschakov, 1955: 190, text-fig. 55. Imajima & Hartman, 1964: 116, pl. 27, figs. f–l. *Sphaerosyllis hystrix*.—not Claparède, 1863; Haswell, 1920a: 224, pl. 18, figs. 32–35.

Material examined. AUSTRALIA. NEW SOUTH WALES. 10 specimens, AM W480 and 1 specimen, AM W26680, Port Jackson, 33°51'S 151°16'E, as *Sphaerosyllis hystrix*, identified by Haswell. 1 specimen, AM W21630, 800 m off Port Botany, Botany Bay, 33°58.75'S 151°11.03'E, 7 m, Australian Museum party, 28 July 1992. 35 specimens, AM W24375, east of North Head, Port Jackson, 33°47.84'S 151°18.95'E, sand, 30 m, Fisheries Research Institute (NSW), 21 July 1989. 1 specimen, AM W26416, Manta Reef, North West Solitary Island, 30°01.5'S 153°16.5'E, lace bryozoan, 19 m, R.T. Springthorpe, 25 Jun 1992. 1 specimen, AM W26417, 100 m north west of Split Solitary Island, 30°14.0'S 153°10.8'E, mixed red algae, 15 m, S.J. Keable, 7 Mar 1992. 1 specimen, AM W26418, 100 m north west of Split Solitary Island, 30°14.0'S 153°10.8'E, mixed red algae, 15 m, S.J. Keable, 7 Mar 1992. 2 specimens, AM W26419, 100 m northwest of Split Solitary Island, 30°14.0'S 153°10.8'E, encrusting algae and ascidians, 16 m, E.L. Albertson, 7 Mar 2000. 1 specimen, AM W26420, Halfway Reef, 200 m, south of Sullivan Reef, Ulladulla, 35°21.42'S 150°29.31'E, airlift over wall of sponges, bryozoa, hydrozoa, 15 m, K. Attwood *et al.*, 3 May 2000. 7 specimens, AM W26546, southwest side of South Solitary Island, 30°12.0'S 153°16.0'E, coral rubble, 18 m, R.T. Springthorpe, 24 Jun 1992. 48 specimens, AM W26611, Grotto Point, Balmoral Beach, Port Jackson, 33°49'S 151°15'E, algae, 4 m, P. Colman, 18 July 1983. 2 specimens, AM W26613, Camp Cove, Port Jackson, 33°50.5'S 151°16.6'E, algae & algal turf, P. Serov & G.D.F. Wilson, 27 Nov 1992.

shafts and blades shorter, about 12–10 µm long, slightly hooked, smooth or provided with short marginal spines (Fig. 54F). Dorsal simple chaetae from chaetiger 1, unidentate, provided with moderately long marginal spines (Fig. 54B,E). Ventral simple chaetae on posterior parapodia, sigmoid, unidentate, smooth (Fig. 54G). Acicula solitary, with tips bent at right angle (Fig. 54D). Pygidium small, provided with few (5–7) long papillae and 2 anal cirri, similar in shape to dorsal cirri but longer (Figs. 53F, 54H). Pharynx slender, through 3 segments; pharyngeal tooth anteriorly located. Proventricle small, through 1 segment, with 13–14 muscle cell rows.

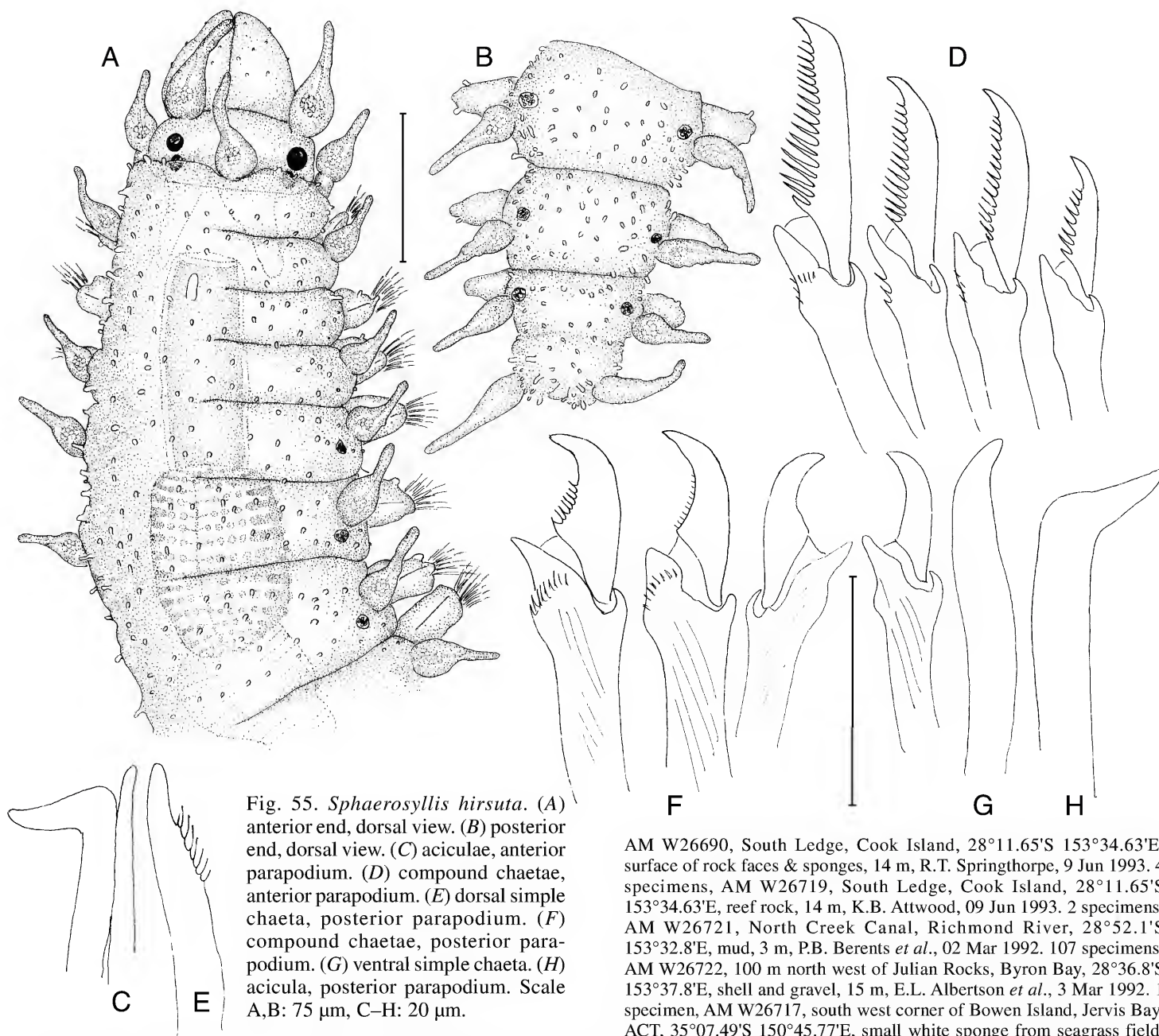


Fig. 55. *Sphaerosyllis hirsuta*. (A) anterior end, dorsal view. (B) posterior end, dorsal view. (C) aciculae, anterior parapodium. (D) compound chaetae, anterior parapodium. (E) dorsal simple chaeta, posterior parapodium. (F) compound chaetae, posterior parapodium. (G) ventral simple chaeta. (H) acicula, posterior parapodium. Scale A,B: 75 µm, C-H: 20 µm.

1 specimen, AM W26615, north east corner of Clark Island, 33°51.85'S 151°14.47'E, inside bottle, 5 m, P.A. Hutchings, 17 Apr 1996. 43 specimens, AM W26646, Bottle and Glass Rocks, Port Jackson, 33°50.9'S 151°16.2'E, 12 m, G. Clark, 11 Dec 1989. 3 specimens, AM W26650, north east corner of Clark Island, 33°51.85'S 151°14.47'E, *Ecklonia* holdfast, 5 m, P.A. Hutchings, 17 Apr 1996. 5 specimens, AM W26652, Barrenjoey Head, Broken Bay, 33°35'S 151°20'E, algae on rocky substrate, 5 m, J.K. Lowry *et al.*, 22 Apr 1983. 2 specimens, AM W26655, Camp Cove, Port Jackson, 33°50.5'S 151°16.6'E, algae & algal turf, P. Serov & G.D.F. Wilson, 27 Nov 1992. 3 specimens, AM W26675, North ledge, Cook Island, 28°11.44'S 153°34.67'E, coralline turf, 10 m, E.L.A. Ho, 8 Jun 1993. 2 specimens, AM W26676, North Ledge, Cook Island, 28°11.44'S 153°34.67'E, sponge, 10 m, A.R. Parker, 08 Jun 1993. 2 specimens, AM W26677, South Ledge, Cook Island, 28°11.65'S 153°34.63'E, clump of solitary ascidians, 14 m, G.D.F. Wilson, 9 Jun 1993. 2 specimens, AM W26678, South Ledge, Cook Island, 28°11.65'S 153°34.63'E, frilly bryozoan, 15 m, R.T. Springthorpe, 9 Jun 1993. 1 specimen, AM W26679, South Ledge, Cook Island, 28°11.65'S 153°34.63'E, yellow/green sponge & crinoid, 12 m, A.R. Parker, 9 Jun 1993. 1 specimen, AM W26685, northeast of Mary's Rock, Cook Island, 28°11.42'S 153°34.79'E, orange frilly bryozoan, 19 m, R.T. Springthorpe, 8 Jun 1993. 2 specimens, AM W26686, South Ledge, Cook Island, 28°11.65'S 153°34.63'E, rock, 15 m, K.B. Attwood, 9 Jun 1993. 1 specimen, AM W26687, North Ledge, Cook Island, 28°11.44'S 153°34.67'E, reef rock, 12 m, K.B. Attwood, 8 Jun 1993. 1 specimen, AM W26688, South Ledge, Cook Island, 28°11.65'S 153°34.63'E, surface of massive sponges, 14 m, R.T. Springthorpe, 9 Jun 1993. 18 specimens, AM W26689, North ledge, Cook Island, 28°11.44'S 153°34.67'E, shell grit, 14 m, K.B. Attwood, 8 Jun 1993. 1 specimen,

AM W26690, South Ledge, Cook Island, 28°11.65'S 153°34.63'E, surface of rock faces & sponges, 14 m, R.T. Springthorpe, 9 Jun 1993. 4 specimens, AM W26719, South Ledge, Cook Island, 28°11.65'S 153°34.63'E, reef rock, 14 m, K.B. Attwood, 09 Jun 1993. 2 specimens, AM W26721, North Creek Canal, Richmond River, 28°52.1'S 153°32.8'E, mud, 3 m, P.B. Berents *et al.*, 02 Mar 1992. 107 specimens, AM W26722, 100 m north west of Julian Rocks, Byron Bay, 28°36.8'S 153°37.8'E, shell and gravel, 15 m, E.L. Albertson *et al.*, 3 Mar 1992. 1 specimen, AM W26717, south west corner of Bowen Island, Jervis Bay, ACT, 35°07.49'S 150°45.77'E, small white sponge from seagrass field, 7 m, P. Serov & G.D.F. Wilson, 08 Dec 1993. 1 specimen, AM W26718, east of launching ramp, Murrays Beach, Jervis Bay, ACT, 35°07.5'S 150°46'E, intertidal pool overhangs with dead, sponge-encrusted barnacles, 0 m, H.E. Stoddart, 28 Jun 1981. 1 specimen, AM W26720, half way along west side of Bowen Island, Jervis Bay, ACT, 35°06.91'S 150°45.91'E, airlift from light grey sponge, 6 m, P. Serov & G.D.F. Wilson, 07 Dec 1993. VICTORIA. 1 specimen, MV F62701, Eastern Bass Strait, 11.7 km W of Pt. Ricardo, 37°49.89'S 148°30.13'E, coarse sand, 27 m depth, 4 Jun 1991. 54 specimens, MV F61900, Eastern Bass Strait, 15.5 km SW of Pt. Ricardo, 37°53.14'S 148°28.94'E, medium sand, 45 m depth, Feb 1991. 4 specimens, MV F87425, Geelong Arm, Port Phillip Bay, 38°09.3'S 144°42.7'E, sand and seagrasses, 3 m depth, 11 Jan 1971. SOUTH AUSTRALIA. 1 specimen, AM W26708, Elliston Reef, 33°39'S 134°53'E, algae from reef flat at low tide, P.A. Hutchings, 11 Mar 1979. 20 specimens, AM W26745, Billy Lights Point, Port Lincoln, 34°45'S 135°53'E, stone washings from sheltered intertidal rocks, I. Loch, 15 Feb 1985. 4 specimens, AM W27117, Flinders Cairn, south of Tulka, on Port Lincoln, 34°49'S 135°47'E, mussel clumps at mid-tide, P.A. Hutchings, 10 Mar 1979. WESTERN AUSTRALIA. 1 specimen, AM W26664, off end of South Mole, Arthur Head, Fremantle, 32°3'S 115°44'E, sponges, 6 m, R.T. Springthorpe, 25 Dec 1983. 3 specimens, AM W26665, off end of South Mole, Arthur Head, Fremantle, 32°3'S 115°44'E, orange tunicates, 6 m, J.K. Lowry, 25 Dec 1983. 1 specimen, AM W27106, Vancouver Peninsula, King George Sound, 35°04'S 117°56'E, seagrass with hydroid/bryozoan, 3 m, J.K. Lowry, 13 Dec 1983. 1 specimen, AM W27107, north end of Long Island, Goss Passage, 28°28.3'S 113°46.3'E, dead coral covered with coralline algae & boring bivalves, 8 m, C. Bryce, 22 May 1994. 14 specimens, AM W27108, north end of Long Island, 28°27.9'S 113°46.3'E, dead coral substrate

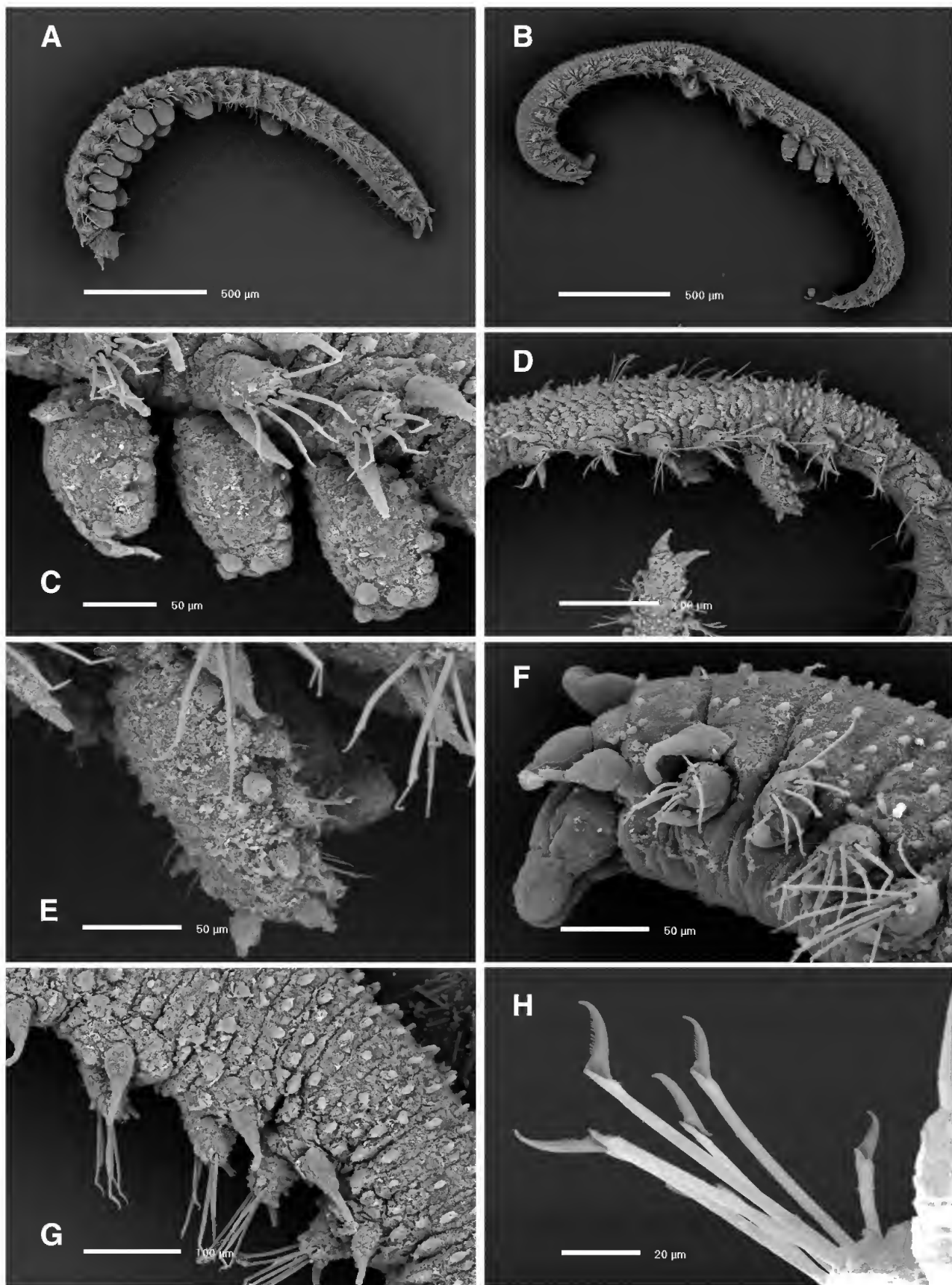


Fig. 56. SEM of *Sphaerosyllis hirsuta*. (A) mature female carrying eggs, lateral view. (B) mature female carrying juveniles, lateral view. (C) detail of early juveniles. (D) midbody and pygidium (with juveniles). (E) detail of a juvenile. (F) anterior end, lateral view. (G) midbody, dorsal view. (H) compound chaetae, anterior parapodium.

with coralline & brown algae, 6 m, C. Bryce, 22 May 1994. 2 specimens, AM W27109, southeast end of Long Island, 28°28.8'S 113°46.5'E, dead coral embedded in calcareous substrate, 30 m, P.A. Hutchings, 22 May 1994. 16 specimens, AM W27110, southeast end of Long Island, 28°28.8'S 113°46.5'E, dead coral substrate covered in coralline algae, 8 m, P.A. Hutchings, 22 May 1994. 2 specimens, AM W27111, Goss Passage, Beacon Island, 28°25.5'S 113°47.0'E, dead coral substrate embedded in fine sediment, 33 m, P.A. Hutchings, 23 May 1994. 10

specimens, AM W27112, off jetty near Fisheries Hut, Beacon Island, 28°25.5'S 113°47.0'E, dead plate-coral substrate—*Acropora*, *Montipora* spp., 12 m, P.A. Hutchings, 23 May 1994. 11 specimens, AM W27113, off south end of Long Island, Beacon Island, 28°28.8'S 113°46.3'E, dead coral substrate covered in coralline algae, 5 m, P.A. Hutchings, 25 May 1994. 1 specimen, AM W27114, Wallabi Island group, 28°27.05'S 113°45.10'E, scallop beds in medium to fine sand with shell debris, 38 m, P.A. Hutchings on FRV "Flinders", 30 May 1994. 2 specimens, AM

W27115, Wallabi Island group, 28°23.61'S 113°45.09'E, scallop beds, shell & sponge debris, 35 m, P.A. Hutchings on FRV "Flinders", 30 May 1994. 1 specimen, AM W27116, west side of Cassini Island, 13°57'S 125°37'E, P.A. Hutchings, 18 July 1988. 1 specimen, AM W27650, outer Ningaloo Reef, off Ned's Camp, Cape Range National Park, 21°59.5'S 113°54.5'E, airlift from living *Porites* sp., 2 m, R.T. Springthorpe and J.K. Lowry, 1 Jan 1984. 1 specimen, AM W27662, Red Bluff, Kalbarri, 27°42'S 114°09'E, mixed coralline algae from rocky shore, 4 m, J.K. Lowry, 10 Jan 1984. 1 specimen, AM W27664, Bush Bay, 30 km south of Carnarvon, 25°10'S 113°39'E, shallow sand flats, 0.5 m, J.K. Lowry & H.E. Stoddart, 6 Jan 1984. 1 specimen, AM W27666, reef west of groyne, 2 km south of Cape Peron, 32°16'S 115°41'E, orange sponge in deep channel of limestone reef, 4.5 m, R.T. Springthorpe, 26 Dec 1983.

Description. Body variable in size, some specimens relatively long, slender, up to 7–8 mm long, 0.25–0.26 mm wide, 50–55 chaetigers, provided with distinct, numerous conical papillae on dorsal and ventral sides, palps, parapodia and pygidium (Figs. 55A,B, 56A,B,D,F,G). Colour light brown to cream in alcohol. Prostomium rectangular, wider than long; 4 moderate to large eyes in trapezoidal to rectangular arrangement. Antennae pyriform, similar in length to palps; lateral antennae inserted on anterior margin of prostomium, median antenna inserted between posterior eyes (Figs. 55A, 56F). Palps triangular, broad, similar in length to prostomium, fused along their length, with a dorsal furrow. Peristomium similar in length to following segments, covering dorsally posterior part of prostomium; tentacular cirri similar to antennae, slightly shorter (Figs. 55A, 56F). Dorsal cirri similar to tentacular cirri, with bulbous bases and relatively short tips (Fig. 55A,B), slightly elongate on midbody (Fig. 56D,G) and posterior segments (Fig. 55B); antennae, tentacular cirri and dorsal cirri with internal granular gland and duct with two openings, one at the middle and other on the tip of the cirrus (Fig. 55A,B), distinct on some of longer specimens, but indistinct on others. Parapodial glands small, indistinct, with granular material (Fig. 55A,B). Anterior parapodia each with 5–7 compound chaetae, some shafts provided with a few short subdistal spines, blades unidentate, provided with moderate to short marginal spines, longer on more dorsal chaetae (Figs. 55D, 56H); moderate dorsoventral gradation in length, 24 µm above 12 µm below (large specimens). Progressively posteriorly diminishing number of compound chaetae on each parapodium to 3–4, shafts slightly larger, blades slightly hooked, smooth or provided with short marginal spines (Fig. 55F), about 16–12 µm long. Solitary simple chaetae from anterior parapodia, usually from chaetiger 1, unidentate, provided with short subdistal marginal spines (Fig. 55E). Ventral simple chaetae from midbody or posterior parapodia, sigmoid, smooth, unidentate (Fig. 55G). Anterior parapodia each with two aciculae, one slender and straight and other slightly larger, distally bent at right angle

(Fig. 55C); midbody and posterior parapodia each with solitary, large bent acicula (Fig. 55H). Pharynx through 4 segments; pharyngeal tooth on anterior margin (Fig. 55A). Proventricle through 2 segments, with 13–15 muscle cell rows. Pygidium small, with two anal cirri similar to dorsal cirri but longer (Fig. 55B); pygidial papillae slightly longer than others on dorsal surface of body.

Remarks. This species is widely distributed, reported in Pacific coasts of South America, New Zealand, Japan and Kurile Islands. The species *Sphaerosyllis californiensis* Hartman may be synonymous with this species.

Distribution. Pacific. Australia (New South Wales, Victoria, South Australia, Western Australia).

Habitat. All substrates, from dead coral, algae, encrusting organisms, to seagrasses and sand. Intertidal to c. 45 m depth.

Genus *Brania* Quatrefages, 1866

Brania Quatrefages, 1866: 18.

Diagnosis. Body small, slender, with few segments. Prostomium with 2 pairs of eyes and, sometimes, 1 pair of eyespots, 3 bowling-pin to spindle-shaped antennae. Palps fused for about their basal 2/3, and the remaining distal 1/3 free. Two pairs of tentacular cirri, bottle-shaped, truncated or bowling-pin shaped. Dorsal cirri on all parapodia, short, bowling-pin shaped or truncated. Parapodia conical, with a distal, rounded small papilla. Parapodial glands present, sometimes inside dorsal cirri. Pharynx provided with an anterior tooth, surrounded by a crown of soft papillae. Compound chaetae with unidentate blades provided with subdistal spines and rounded tips; aciculae with rounded, slightly hollow tips. Dorsal simple chaetae usually subdistally serrated. Ventral simple chaetae sigmoid, usually unidentate. Mature males with natatory chaetae; mature females brooding eggs and juveniles ventrally, without natatory chaetae.

Type species. *Exogone pusilla* Dujardin, 1839 (fide Hartman, 1959).

Brania pusilla (Dujardin, 1839)

Fig. 57A–E

Exogone pusilla Dujardin, 1839: 298, Figs. 9, 10.

Grubea pusilla.—Fauvel, 1923: 299, fig. 115, a–f.

Brania pusilla.—Day, 1967: 267, fig. 129d–f. Campoy, 1982: 248, pl. 14. Hartmann-Schröder, 1971: 163; 1982: 68, figs. 51, 52; 1984: 22; 1986: 42; 1987: 39; 1989: 28; 1996: 169, fig. 72. Gardiner, 1976: 130, fig. 10o. San Martín, 1984a: 181, pl. 38; 2003: 151, figs. 73, 74.

Grubea pusilloides.—Haswell, 1920a: 222, pl. 17, figs. 27–29.

Brania pusilloides.—Day & Hutchings, 1979: 100.

Key to the species of *Brania* recorded from Australia

- 1 Dorsal cirri distally truncated, with fibrillar inclusions *B. pusilla*
- Dorsal cirri distally rounded, not truncated, without fibrillar inclusions 2
- 2 Marked dorsoventral gradation in length of blades of compound chaetae throughout; posterior dorsal simple chaetae with about 4 similar subdistal serrations; dorsal cirri with subdistal constriction more or less marked *B. articulata*
- Slight dorsoventral gradation in length of blades of compound chaetae; posterior dorsal simple chaetae with subdistal serrations of different sizes; dorsal cirri without subdistal constriction *B. furcelligera*

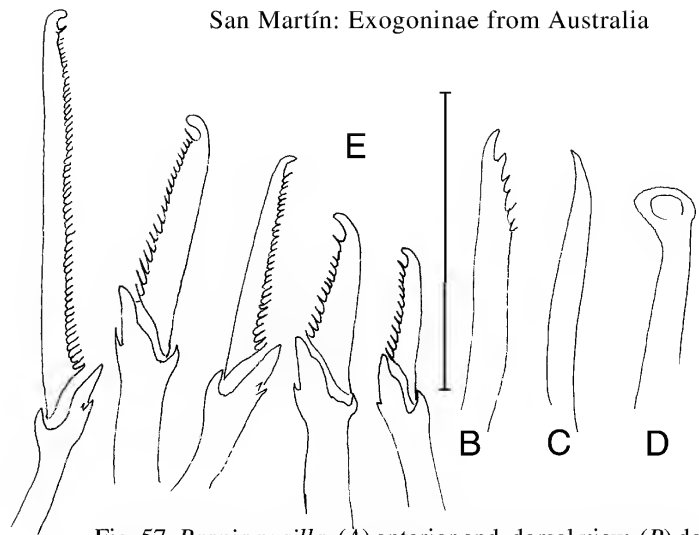
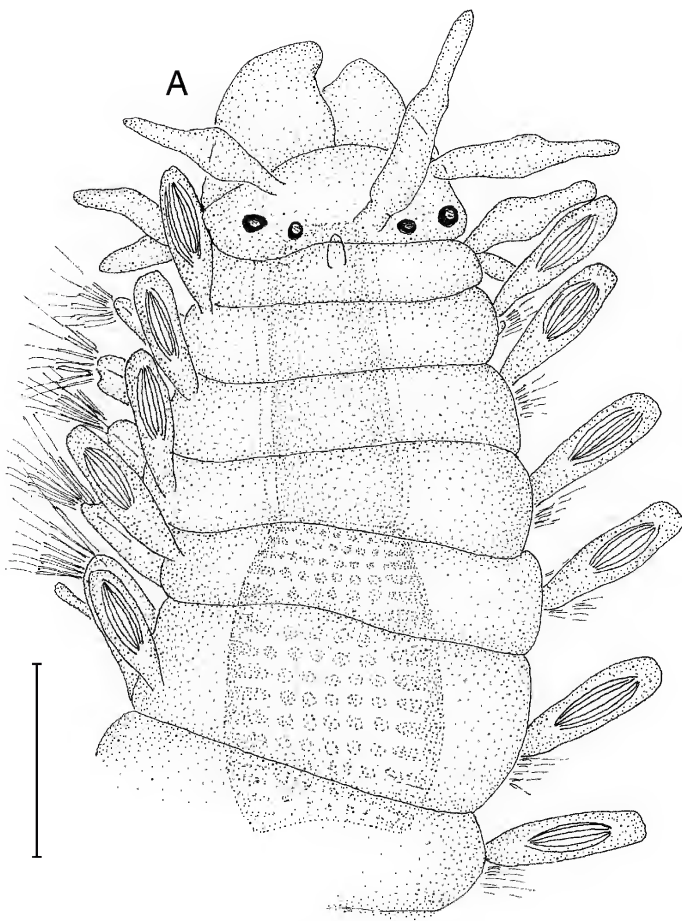


Fig. 57. *Brania pusilla*. (A) anterior end, dorsal view. (B) dorsal simple chaeta. (C) ventral simple chaeta. (D) acicula. (E) compound chaetae, midbody. Scale A: 0.1 mm, B–F: 20 μ m.

Material examined. AUSTRALIA: NEW SOUTH WALES. SYNTYPES of *Grubea pusilloides*, 2 specimens, AM W478, Port Jackson, 33°51'S 151°16'E. Collected & identified by Haswell. 1 specimen on slide, AM W25236, Port Jackson, 33°50'S 151°16'E. Collected & identified by Haswell. 1 specimen on slide, AM W25237. Identified by Haswell. 1 specimen on slide, AM W25238. Identified by Haswell. 1 specimen on slide, AM W8632. Identified by Haswell.

Description. Body small, short, about 2 mm long, 0.13 mm wide, for 27 chaetigers. The longest specimen examined (W2537) is 1.65 mm long, with 26 chaetigers. Prostomium semi-circular, with 4 eyes in trapezoidal arrangement. Antennae elongate, spindle-shaped to bowling-pin shaped; median antenna longer than lateral ones, similar in length to prostomium and palps together, inserted between posterior eyes; lateral antennae slightly longer than prostomium, inserted in front of and slightly medial to anterior eyes, similar in shape to median antenna. Palps similar in length to prostomium, fused on their basal $\frac{2}{3}$ (Fig. 57A). Peristomium similar in length to following segments; dorsal tentacular cirri similar to lateral antennae but slightly shorter and distally slightly truncated, ventral tentacular cirri similar to dorsal ones but shorter. Dorsal cirri sub-rectangular, distally truncated, oval in shape, containing fibrillar material (Fig. 57A), slightly longer than parapodial lobes. Ventral cirri digitiform, shorter than parapodial lobes. Compound chaetae similar throughout, slightly shorter on anterior parapodia, with heterogomph articulation, provided with short subdistal spines on shafts; blades unidentate, distally rounded, slightly hooked, and short marginal spines and a subdistal spine near tip, longer than other spines, more marked on longer blades (Fig. 57E). Parapodium each with 6–8 compound chaetae on anterior parapodia, 3–4 on posterior parapodia; strong dorsoventral gradation in length of blades; on each parapodium 1–2 compound chaetae with

long blades, about 28 μ m long, and remaining chaetae with shorter blades, posteriorly diminishing progressively in length, 16–17 μ m above, 10 μ m below. Dorsal simple chaetae from anterior parapodia, bidentate, provided with short marginal spines (Fig. 57B). Ventral simple chaetae on each posterior parapodia, sigmoid, smooth and unidentate (Fig. 57C). Solitary acicula on each parapodium, tip enlarged and rounded, slightly hollow (Fig. 57D). Pharynx longer than proventricle, through 4 segments; pharyngeal tooth conical, located near opening (Fig. 57A). Proventricle short, through 2 segments, with about 15–16 muscle cell rows. Pygidium small, bilobed, with two long anal cirri, similar in length to median antenna. Attached juveniles lacking eyes, dorsal cirri on chaetiger 2 and dorsal tentacular cirri.

Remarks. The Australian specimens were originally described as *Grubea pusilloides* and was considered as a different species than *Brania pusilla* from the European coasts; I have not found, however, any difference between the Australian and European specimens, so I consider both as synonyms.

Distribution. East Atlantic Ocean, from the North Sea to South Africa, extending to the Indian coasts of South Africa. West Atlantic (North Carolina). Mediterranean Sea. Australia (Western Australia, South Australia, Victoria, New South Wales).

Habitat. Found on all hard substrates, seagrasses, algae, calcareous concretions, also in coarse to fine sand, from intertidal to about 200 m depth, rare in waters deeper than 40 m.

Brania articulata Hartmann-Schröder, 1982

Fig. 58A–J

Brania articulata Hartmann-Schröder, 1982: 68, figs. 53–56; 1990: 52, fig. 23.

Material examined. AUSTRALIA: QUEENSLAND. 1 specimen, AM W27892, Hinchinbrook Channel, 18°20'S 146°4'E, tidal mud- and sandflats, S. Dittmann, 22 Oct 1991. WESTERN AUSTRALIA. 2 specimens, AM W27098, Goss Passage, Beacon Island, 28°25.5'S 113°47.0'E, dead *Acropora* plates with sponges, ascidians & algae, 23 m, P.A. Hutchings, 19 May 1994. 1 specimen, AM W27099, Goss Passage, Beacon Island, 28°25.5'S 113°47.0'E, dead *Acropora* plates covered in coralline algae, 8 m, P.A. Hutchings, 19 May 1994. 2 specimens, AM W27100, north end of Long Island, 28°27.9'S 113°46.3'E, dead coral substrate with coralline & brown algae, 6 m, C. Bryce, 22 May 1994. 1 specimen, AM W27101, southeast end of Long Island, 28°28.8'S 113°46.5'E, dead coral

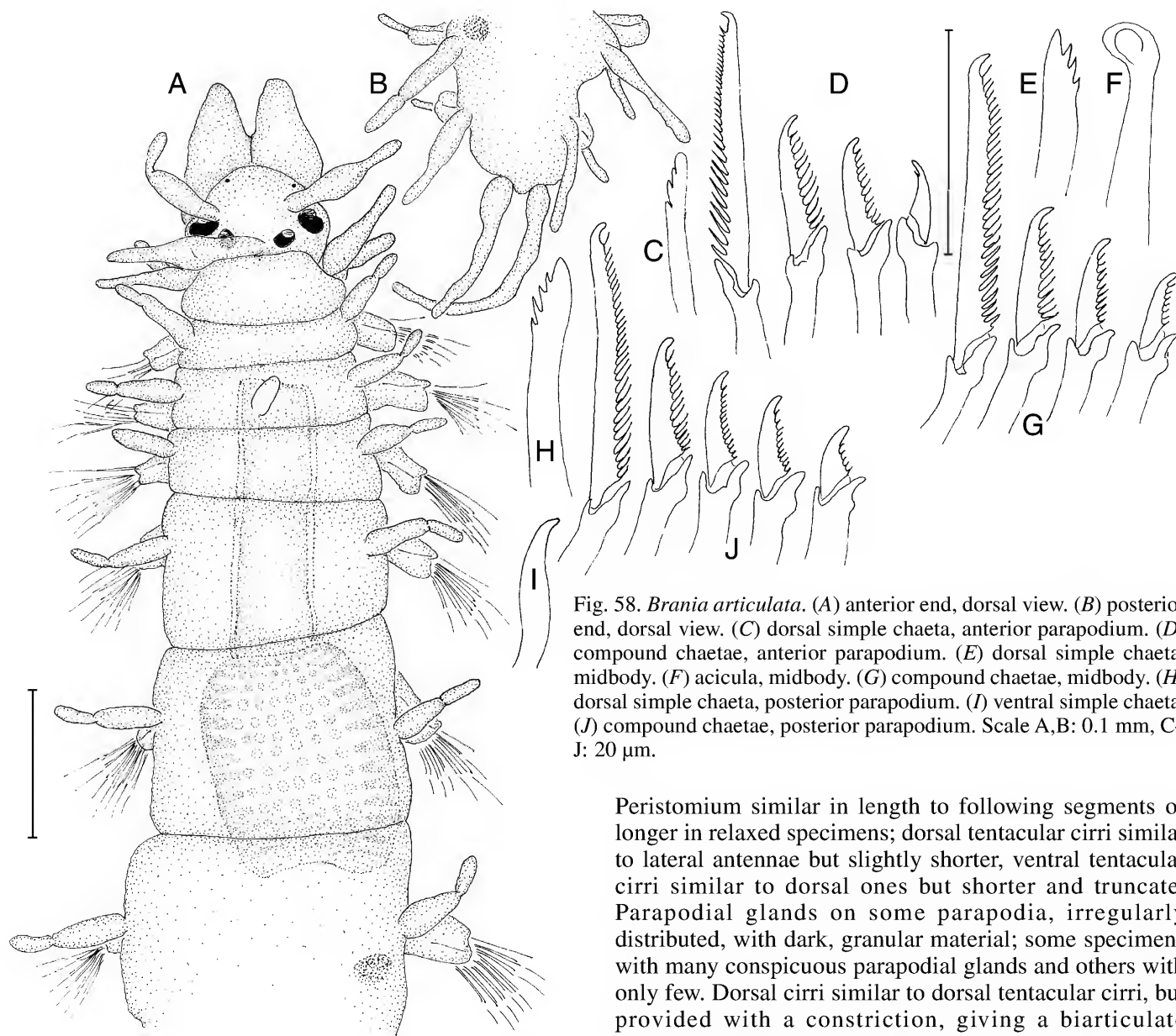


Fig. 58. *Brania articulata*. (A) anterior end, dorsal view. (B) posterior end, dorsal view. (C) dorsal simple chaeta, anterior parapodium. (D) compound chaetae, anterior parapodium. (E) dorsal simple chaeta, midbody. (F) acicula, midbody. (G) compound chaetae, midbody. (H) dorsal simple chaeta, posterior parapodium. (I) ventral simple chaeta. (J) compound chaetae, posterior parapodium. Scale A,B: 0.1 mm, C–J: 20 µm.

embedded in calcareous substrate, 30 m, P.A. Hutchings, 22 May 1994. 1 specimen, AM W27102, northeast entrance to Goss Passage, Beacon Island, 28°27.9'S 113°46.7'E, dead branching *Acropora* with coralline & brown algae, 24 m, P.A. Hutchings, 25 May 1994. 1 specimen, AM W27103, northeast entrance to Goss Passage, Beacon Island, 28°27.9'S 113°46.7'E, dead plate-like *Acropora* covered in coralline algae, 8 m, P.A. Hutchings, 25 May 1994. 1 specimen, AM W27104, East Montlivet Island, 15°06'S 125°18'E, 6 m, P.A. Hutchings, 16 July 1988. 2 specimens, AM W27105, southwest corner of Lucas Island, 15°13'S 124°31'E, 30 m, P.A. Hutchings, 24 July 1988. 1 specimen, AM W27415, north end of beach, Bundegi Reef, Exmouth Gulf, 21°49'S 114°11'E, rocky rubble, coralline algae with green epiphyte, 2 m, H.E. Stoddart, 4 Jan 1984. 2 specimens, AM W27421, Red Bluff, Kalbarri, 27°42'S 114°09'E, brown alga from surf zone on rocky shore, 0.5 m, H.E. Stoddart, 9 Jan 1984.

Description. Body small, a mature male about 2.54 mm long, 0.12 mm wide, for 29 chaetigers. Prostomium semi-circular to pentagonal, with 4 large eyes in trapezoidal arrangement and 2 anterior, small eyespots. Antennae elongate, spindle-shaped to bowling-pin shaped; median antenna longer than lateral ones, slightly shorter than combined length of prostomium and palps, inserted between posterior eyes; lateral antennae slightly longer than prostomium, inserted in front of anterior eyes, similar in shape to median antenna. Palps similar in length to prostomium, fused for their basal half (Fig. 58A).

Peristomium similar in length to following segments or longer in relaxed specimens; dorsal tentacular cirri similar to lateral antennae but slightly shorter, ventral tentacular cirri similar to dorsal ones but shorter and truncate. Parapodial glands on some parapodia, irregularly distributed, with dark, granular material; some specimens with many conspicuous parapodial glands and others with only few. Dorsal cirri similar to dorsal tentacular cirri, but provided with a constriction, giving a biarticulate appearance (Fig. 58A), longer than parapodial lobes, those of posterior parapodia longer than those of anterior parapodia (Figs. 58A, 58B). Ventral cirri digitiform, shorter than parapodial lobes. Compound chaetae similar throughout, slightly shorter on anterior parapodia, with heterogomph articulation; blades unidentate, distally rounded, slightly hooked, marginal spine moderate in length; a subdistal spine near tips, longer than other spines, more distinct on longer blades (Figs. 58D,G,J). Parapodium each with 6–7 compound chaetae on anterior parapodia, 5 on posterior parapodia; strong dorsoventral gradation in length of blades; on each parapodium 1–2 compound chaetae with long blades, about 28 µm long in midbody, and remaining chaetae with shorter blades, diminishing progressively in length posteriorly, 12 µm above, 8 µm below. Dorsal simple chaetae from anterior parapodia, unidentate, provided with about 4–5 short serrations on margin, all similar (Figs. 58C,E,H); anterior dorsal simple chaetae more slender than posterior ones (Fig. 58C,H). Ventral simple chaetae on posterior parapodia, sigmoid, smooth and unidentate (Fig. 58I). Solitary acicula with tips enlarged and rounded, slightly hollow (Fig. 58F). Pharynx longer than proventricle, through 3 segments; pharyngeal tooth conical, located on anterior margin (Fig. 58A). Proventricle short, through 1–2 segments, with about 15–

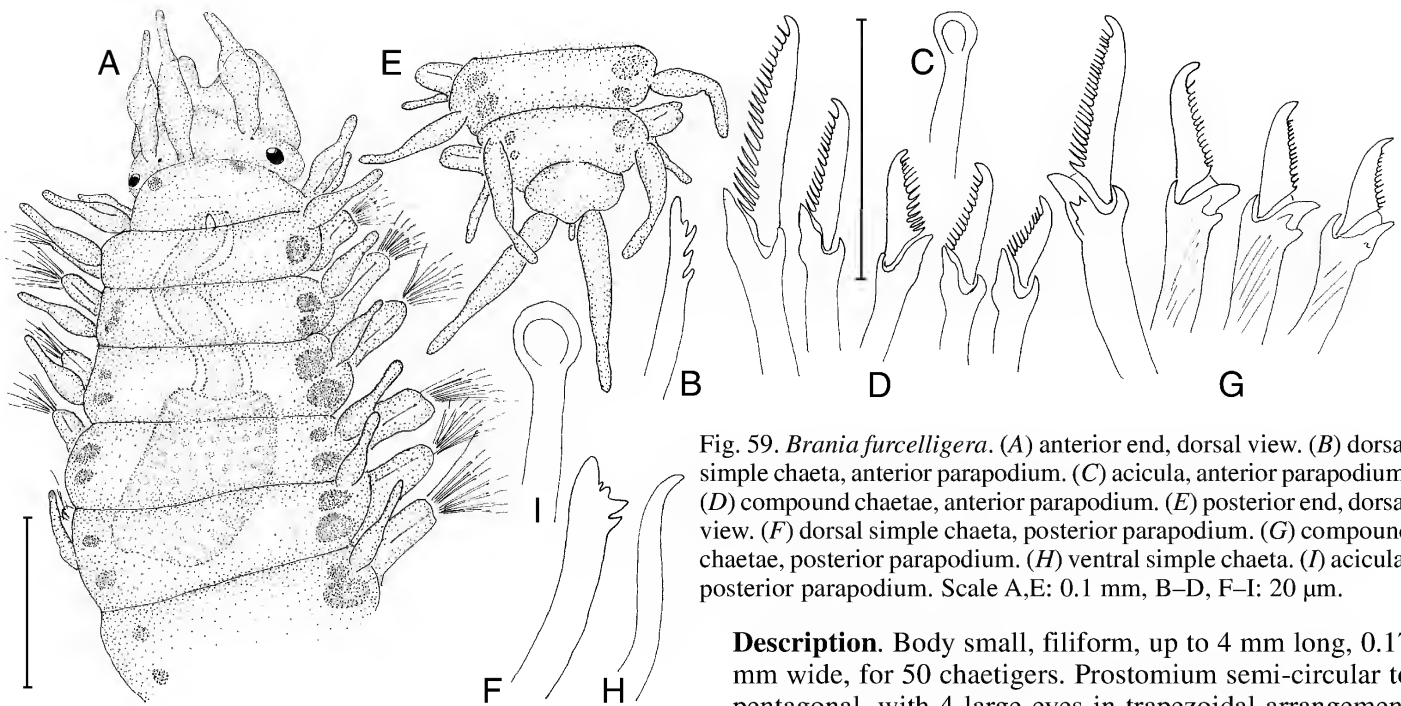


Fig. 59. *Brania furcelligera*. (A) anterior end, dorsal view. (B) dorsal simple chaeta, anterior parapodium. (C) acicula, anterior parapodium. (D) compound chaetae, anterior parapodium. (E) posterior end, dorsal view. (F) dorsal simple chaeta, posterior parapodium. (G) compound chaetae, posterior parapodium. (H) ventral simple chaeta. (I) acicula, posterior parapodium. Scale A,E: 0.1 mm, B–D, F–I: 20 µm.

17 muscle cell rows. Pygidium small, bilobed, with 2 long anal cirri, longer than median antenna (Fig. 58B).

Remarks. *Brania glandulosa* Hartmann-Schröder, 1980b, from West Indies, has similar compound and simple chaetae, but the antennae are more elongate, the parapodial glands are much more developed, and the proventricle is slightly longer (Hartmann-Schröder, 1980b).

Distribution. Australia (Western Australia, New South Wales, Queensland).

Habitat. Fine sand and algae. In dead corals. Eulittoral and sublittoral, known up to 30 m depth.

Brania furcelligera (Augener, 1913)

Fig. 59A–I

Grubea furcelligera Augener, 1913: 256, pl. 3, figs. 20, 21, text-fig. 39.

Brania furcelligera.—Day & Hutchings, 1979: 100. Hartmann-Schröder, 1974b: 48, figs. 27–32; 1980a: 54, fig. 44; 1983: 133, fig. 21; 1991: 38; 1992a: 59.

Material examined. AUSTRALIA: NEW SOUTH WALES. 1 specimen, AM W26437, 100 m north west of Split Solitary Island, 30°14.0'S 153°10.8'E, encrusting algae and ascidians, 16 m, E.L. Albertson, 7 Mar 1992. SOUTH AUSTRALIA. 7 specimens, AM W26743, Victor Harbour, 35°33'S 138°38'E, algal washings, P.A. Hutchings, 16 Mar 1979. 7 specimens, AM W26744, Elliston Reef, 33°39'S 134°53'E, algal washings, P.A. Hutchings, 11 Mar 1979. WESTERN AUSTRALIA. 2 specimens, AM W26816, inshore reef, Ned's Camp, Cape Range National Park, 21°59'S 113°55'E, very fine sediment and sand from patches in reef, 1 m, H.E. Stoddart, 2 Jan 1984. 1 specimen, AM W27095, east side of West Wallabi Island, 28°27.9'S 113°40.9'E, in *Posidonia australis* root mat with epifauna, 2 m, P.A. Hutchings, 26 May 1994. 2 specimens, AM W27410, north end of beach, Bundegi Reef, Exmouth Gulf, 21°49'S 114°11'E, rocky rubble, coralline algae with green epiphyte, 2 m, H.E. Stoddart, 4 Jan 1984. 1 specimen, AM W27412, Red Bluff, Kalbarri, 27°42'S 114°09'E, mixed coralline algae from rocky shore, 4 m, J.K. Lowry, 10 Jan 1984. 3 specimens, AM W27420, north end of beach, Buni Reef, Exmouth Gulf, 21°49'S 114°11'E, rocky rubble, brown algae with epiphytes, sediment, 2 m, H.E. Stoddart, 4 Jan 1984.

Description. Body small, filiform, up to 4 mm long, 0.17 mm wide, for 50 chaetigers. Prostomium semi-circular to pentagonal, with 4 large eyes in trapezoidal arrangement and 2 anterior small eyespots. Antennae elongate, spindle-shaped to bowling-pin shaped; median antenna longer than lateral ones, slightly shorter than prostomium and palps together, inserted between posterior eyes and eyespots; lateral antennae slightly longer than prostomium, inserted in front of anterior eyes, similar in shape to median antenna. Palps similar in length to prostomium, fused for their basal half (Fig. 59A). Peristomium similar in length to following segments, covering dorsally posterior margin of prostomium; dorsal tentacular cirri similar to lateral antennae but shorter, ventral tentacular cirri similar to dorsal ones but shorter. Parapodial glands conspicuous, with dark, granular material, usually 2 glands per parapodium. Dorsal cirri similar to dorsal tentacular cirri (Fig. 59A), slightly longer than parapodial lobes, longer on posterior chaetigers than on anterior chaetigers (Fig. 59A,E). Ventral cirri digitiform, shorter than parapodial lobes. Compound chaetae similar throughout, but having heterogomph articulation on anterior parapodia (Fig. 59D), and hemigomph articulations on posterior parapodia, with thicker shafts, provided with a few thick spines (Fig. 59G); blades unidentate, distally rounded, slightly hooked, marginal spines moderate in length; a subdistal spine near tip longer than other spines, more marked on longer blades (Fig. 59D,G). Parapodium each with about 8 compound chaetae on anterior parapodia, 5 on posterior parapodia; slight dorsoventral gradation in length of blades, diminishing progressively in length, 18 µm above, 6.5 µm below on anterior parapodia; 14 µm above, 8 µm below on posterior parapodia. Dorsal simple chaetae from anterior parapodia, unidentate, provided with about 4–5 short marginal serrations of different sizes, one of them much larger than others (Fig. 59B,F), posterior dorsal simple chaetae much thicker than anterior ones. Ventral simple chaetae on posterior parapodia, sigmoid, smooth and unidentate (Fig. 59H). Solitary acicula on each parapodium, tip enlarged, rounded, and slightly hollow (Fig. 59C,I). Pharynx longer than proventricle, through 3–4 segments; pharyngeal tooth conical, located on anterior margin (Fig. 59A). Proventricle short, through 2 segments, with about 16–18 muscle cell rows. Pygidium small, bilobed, with 2

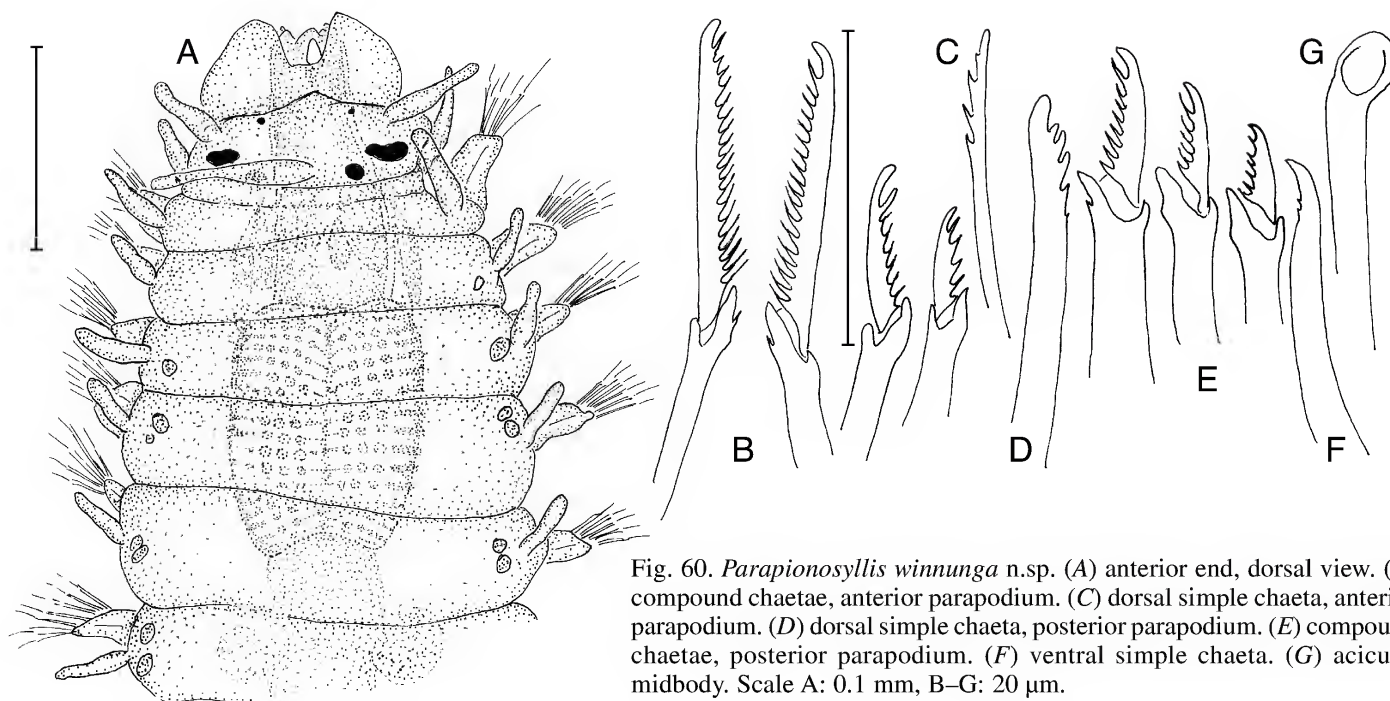


Fig. 60. *Parapionosyllis winnunga* n.sp. (A) anterior end, dorsal view. (B) compound chaetae, anterior parapodium. (C) dorsal simple chaeta, anterior parapodium. (D) dorsal simple chaeta, posterior parapodium. (E) compound chaetae, posterior parapodium. (F) ventral simple chaeta. (G) acicula, midbody. Scale A: 0.1 mm, B–G: 20 µm.

long anal cirri, longer than median antenna (Fig. 59E).

Remarks. *Brania arminii* (Langerhans, 1881), from the Canary Islands, Mediterranean Sea and Red Sea, is similar, differing in the shape of dorsal simple chaetae (see Langerhans, 1881; Núñez *et al.*, 1992; San Martín, 1984a, 2003).

Distribution. Australia (New South Wales, South Australia, Western Australia, Queensland). South Africa, New Zealand. Islands of tropical Pacific.

Habitat. Sand, coralline sand, algae, corals. Intertidal and shallow water.

Genus *Parapionosyllis* Fauvel, 1923

Parapionosyllis Fauvel, 1923: 289.

Diagnosis. Body small to minute. Prostomium with 2 pairs of eyes and, sometimes, a pair of eyespots, 3 bowling-pin shaped antennae. Palps partially fused, distal half or $\frac{1}{3}$ free of each other. Single pair of tentacular cirri, bottle- or bowling-pin shaped, located lateroventrally. Dorsal cirri on all parapodia, short, bowling-pin shaped. Parapodial lobes conical, with a small, thin distal rounded papilla. Parapodial glands present. Pharynx provided with an anterior tooth, surrounded by soft papillae. Compound chaetae with unidentate blades provided with a subdistal spine and rounded tip; aciculae with a rounded, slightly hollowed tip. Dorsal simple chaetae usually subdistally serrated. Ventral simple chaetae sigmoid, usually unidentate. Mature males with natatory chaetae; mature females brooding eggs or juveniles ventrally, lacking natatory

chaetae. *Parapionosyllis* is identical to *Brania*, but having a single pair rather than two pairs of tentacular cirri.

Type species. *Pionosyllis gestans* Pierantoni, 1903 (fide Hartman, 1959).

Parapionosyllis winnunga n.sp.

Fig. 60A–G

Material examined. AUSTRALIA: QUEENSLAND. HOLOTYPE: AM W26449, Halifax Bay, north of Townsville, 19°09'S 146°37'E, 5 m, Queensland Nickel Pty Ltd, July 1985. PARATYPE: 1 specimen, AM W26450, Halifax Bay, 19°10'S 146°44'E, 5 m, Queensland Nickel Pty Ltd, July 1977.

Description. Body minute, 1.8 mm long, 0.11 mm wide, for 27 chaetigers. Prostomium ovate, wider than long, with 4 large eyes in trapezoidal arrangement and 2 anterior small eyespots, anterior eyes larger than posterior eyes. Antennae slender and proportionally short, spindle-shaped, bowling-pin shaped; median antenna longer than lateral ones, shorter than combined length of prostomium and palps, inserted between posterior eyes; lateral antennae slightly shorter than prostomium, inserted in front of anterior eyes and lateral to eyespots, similar in shape to median antenna. Palps similar in length to prostomium, fused for their basal half (Fig. 60A). Peristomium shorter than following segments; tentacular cirri similar to lateral antennae but shorter. Parapodial glands small, with dark, granular material, usually 2 glands per parapodium. Dorsal cirri similar to lateral antennae (Fig. 60A), slightly longer than parapodial lobes. Ventral cirri digitiform, shorter than parapodial lobes. Compound chaetae similar throughout, but having

Key to the species of *Parapionosyllis* recorded from Australia

- 1 Blades of compound chaetae provided with short spines and a long, distinct subdistal erect spine *P. winnunga* n.sp.
- Blades of compound chaetae with moderately long spines and subdistal spine not longer than marginal spines *P. richardi* n.sp.

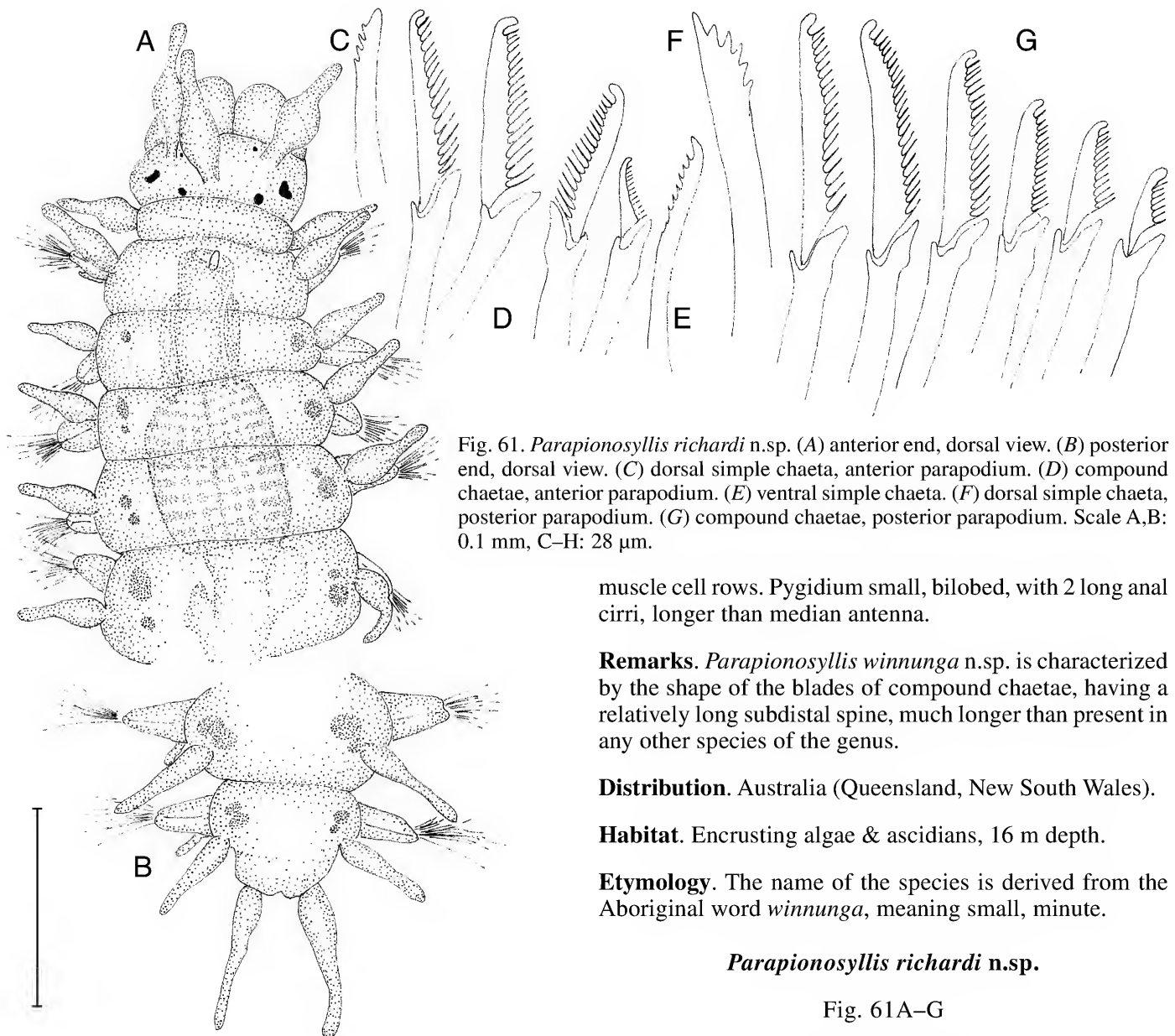


Fig. 61. *Parapionosyllis richardi* n.sp. (A) anterior end, dorsal view. (B) posterior end, dorsal view. (C) dorsal simple chaeta, anterior parapodium. (D) compound chaetae, anterior parapodium. (E) ventral simple chaeta. (F) dorsal simple chaeta, posterior parapodium. (G) compound chaetae, posterior parapodium. Scale A,B: 0.1 mm, C–H: 28 μ m.

muscle cell rows. Pygidium small, bilobed, with 2 long anal cirri, longer than median antenna.

Remarks. *Parapionosyllis winnunga* n.sp. is characterized by the shape of the blades of compound chaetae, having a relatively long subdistal spine, much longer than present in any other species of the genus.

Distribution. Australia (Queensland, New South Wales).

Habitat. Encrusting algae & ascidians, 16 m depth.

Etymology. The name of the species is derived from the Aboriginal word *winnunga*, meaning small, minute.

***Parapionosyllis richardi* n.sp.**

Fig. 61A–G

Material examined. AUSTRALIA: WESTERN AUSTRALIA. HOLOTYPE: AM W27398, north end of beach, Bundegi Reef, Exmouth Gulf, 21°49'S 114°11'E, rocky rubble, coralline algae with green epiphyte, 2 m, H.E. Stoddart, 4 Jan 1984. PARATYPES: 2 specimens, AM W26799, north east entrance to Goss Passage, Beacon Island, 28°27.9'S 113°46.7'E, dead plates of *Acropora*, covered in coralline algae, 8 m, P.A. Hutchings, 25 May 1994.

Description. Body minute, holotype 1.12 mm long, 0.13 mm wide, for 20 chaetigers, paratype in two pieces, 2.5 mm long, 0.1 mm wide, for 27 chaetigers. Prostomium ovate, wider than long, with 4 small eyes in trapezoidal arrangement and 2 anterior small eyespots, anterior eyes larger than posterior eyes, reniform. Antennae thick, spindle- to bowling-pin shaped, with distinct median enlargement; median antenna longer than lateral ones, shorter than prostomium and palps together, inserted between posterior eyes; lateral antennae similar in length to prostomium, inserted in front of anterior eyes and just lateral to eyespots, similar in shape to median antenna. Palps similar in length to prostomium, fused for their basal half (Fig. 61A). Peristomium shorter than following segments; tentacular cirri similar to lateral antennae but shorter. Parapodial glands small, with dark, granular material, usually 2 glands per parapodium. Dorsal cirri bowling-pin shaped (Fig. 61A), longer than parapodial lobes. Parapodial lobes conical, with

heterogomph articulation on anterior parapodia (Fig. 60B), and hemigomph articulation with thicker shafts on posterior parapodia (Fig. 60E); blades unidentate, distally rounded, slightly hooked, marginal spines moderate in length, and a subdistal spine near tip, much longer than other spines (Fig. 60B,E). Anterior parapodia each with 7 compound chaetae, 1–2 with long, slender blades about 20 μ m long, with moderate, thin marginal spines, and 5 compound chaetae with shorter blades, diminishing progressively in length, 10 μ m above, 5 μ m below; long blades absent from midbody; posterior parapodia each with 6 compound chaetae, with thicker shafts, dorsoventral gradation in length of blades, 10 μ m above, 6 μ m below, and short marginal spines. Dorsal simple chaetae from chaetiger 1, unidentate, provided with about 4–5 short serrations, all similar (Fig. 60D), anterior dorsal simple chaetae slender (Fig. 60C). Ventral simple chaetae on each parapodium from about chaetiger 18, sigmoid, smooth and unidentate (Fig. 60F). Solitary acicula on each parapodium, tip enlarged and rounded, slightly hollowed distally (Fig. 60G). Pharynx longer than proventricle, through 3–4 segments; pharyngeal tooth conical, located on anterior margin (Fig. 60A). Proventricle short, through 2–2½ segments, with about 13

a small, thin distal rounded papilla. Ventral cirri digitiform, shorter than parapodial lobes. Compound chaetae similar throughout, (Fig. 61D,G); blades unidentate, distally distinctly rounded, slightly hooked, marginal spines moderate in length; subdistal spine near tip, similar to other spines but slightly longer and thicker (Fig. 61D,G). Parapodia each with about 6–8 compound chaetae, blades 18 μm above 6 μm below in midbody segments (Fig. 61G); chaetae of anterior parapodia with slightly shorter blades (Fig. 61D), diminishing progressively in length, 10 μm above, 5 μm below; long blades disappearing in posterior-most parapodia. Dorsal simple chaetae from chaetiger 1, unidentate, provided with about 4–5 short spines of similar size (Fig. 61F), anterior dorsal simple chaetae slender (Fig. 61C). Ventral simple chaetae on most posterior parapodia, sigmoid, with short marginal spines and unidentate (Fig. 61E). Solitary acicula in each parapodium, tip enlarged and rounded, slightly hollow. Pharynx similar in length to proventricle, through 2 segments; pharyngeal tooth conical, located on anterior margin (Fig. 61A). Proventricle short, through 2–2½ segments, with about 13 muscle cell rows. Pygidium small, bilobed, with two anal cirri, similar to posterior dorsal cirri, but longer (Fig. 61B).

Remarks. *Parapionosyllis richardi* n.sp., is characterized by having compound chaetae with a strong gradation in length of blades, provided with moderately long marginal spines and dorsal simple chaetae with few teeth, all similar in size. *Parapionosyllis macaronesiaensis* Brito, Núñez & San Martín (2000), from Canary and Madeira Islands (see Brito *et al.*, 2000), has similar chaetae, but the dorsalmost compound chaetae are provided with long blades and the remaining are much shorter, with a dorsoventral gradation, and the dorsal simple chaetae have 2 teeth longer than the rest. The most similar species appears to be *Parapionosyllis elegans* (Pierantoni, 1903); both species have compound chaetae with moderately long marginal spines and gradation in size of blades. The antennae of *P. elegans*, however, have a smaller enlargement, longer the proventricle, the ventral simple chaetae are smooth, and the dorsal simple chaetae have a distinctly longer and thicker tooth (see Pierantoni, 1903; San Martín, 2003). *Parapionosyllis uebelackerae* San Martín (1991b), from the Gulf of México, is a larger species, with longer blades on the compound chaetae, although the dorsal simple chaetae are similar (San Martín, 1991b).

Distribution. Australia (Western Australia).

Habitat. In dead corals.

Etymology. The species is dedicated to Mr Richard Johnson, of The Australian Museum.

Genus *Exogone* Örsted, 1845

Exogone Örsted, 1845: 20.

Diagnosis. Body small, slender, more or less filiform. Prostomium with 3 antennae, exceptionally without antennae; usually 4 eyes, sometimes also with 2 eyespots, occasionally without eyes. Palps well developed, completely fused to each other or with terminal notch. Single pair of minute tentacular cirri. Dorsal cirri usually small, papilliform to oval, present on all segments or absent on chaetiger 2 in adults of some species. Usually compound chaetae and dorsal and ventral simple chaetae; sometimes blades fused to shafts or without blades, forming simple chaetae. Two usually long anal cirri present. Body surface smooth. Pharynx with anterior margin surrounded by soft lobes, with anterior tooth. Mature females carrying eggs ventrally, developing to embryos and juveniles, lacking capillary notochaetae (natatory chaetae); mature males with long natatory chaetae; some species shown to be viviparous.

The genus was revised by San Martín (1991a), who recognized three subgenera, *Parexogone* Mesnil & Caullery, 1918; *Exogone* Örsted, 1845; and *Sylline* Claparède, 1864. This diagnosis is here slightly modified.

Type species. *Exogone naidina* Örsted, 1845 (Hartman, 1959).

Subgenus *Parexogone* Mesnil & Caullery, 1918

Parexogone Mesnil & Caullery, 1918: 125.

Diagnosis. Compound chaetae not modified, all with heterogomph articulations, falcigers all similar in shape and blade length, or falcigers and heterogomph spiniger-like (elongate falcigers) with shaft tips simple, blades relatively similar to falcigers but longer. Dorsal simple chaetae similar throughout body, tips unidentate or bidentate, with both teeth similar.

Type species. *Paedophylax hebes* Webster & Benedict, 1884.

Key to the subgenera of *Exogone*

- 1 Compound chaetae with tapering, elongated, bidentate falcigers, both teeth similar, and, sometimes, some compound chaetae on each parapodium with elongate, spiniger-like blade. Probably viviparous species (only proved on a few species) *Parexogone*
- Compound chaetae otherwise, with both elongated, spiniger-like blades and other with short falcigers, or blades missing. Females brooding eggs ventrally, developing juveniles 2
- 2 Compound chaetae on most parapodia with short blades, with subdistal tooth smaller than distal tooth, together a single (or few) compound chaeta with long, filiform, spiniger-like blade *Exogone*
- Compound chaetae with blades minute, fused to shafts or absent *Sylline*

Key to the species of *Exogone* (*Parexogone*) recorded from Australia

- 1 Adults with dorsal cirri on chaetiger 2 2
- Adults without dorsal cirri on chaetiger 2 6
- 2 All antennae small, papilliform. Palps free from each other for distal 1/3 *E. (P.) exmouthensis*
- Antennae longer, not papilliform. Palps fused along their length 3
- 3 Median antenna similar to combined length of prostomium and palps; lateral antennae spherical to egg-shaped *E. (P.) penelopeae* n.sp.
- Median antenna distinctly longer than combined length of prostomium and palps; lateral antennae elongate 4
- 4 Dorsal and ventral simple chaetae bidentate, with both teeth similar *E. (P.) wolffi*
- At least, ventral simple chaetae with subdistal tooth distinctly larger than distal one 5
- 5 Ventral simple chaetae large, distinctly thick. Dorsal simple chaetae with subdistal tooth larger than distal one. Anterior parapodia each with some chaetae provided with long, spiniger-like blades *E. (P.) patriciae* n.sp.
- Ventral simple chaetae not so large. Dorsal simple chaetae with both teeth similar. Without compound chaetae with long, spiniger-like blades *E. (P.) annamurrayae* n.sp.
- 6 Median antenna long, similar in length to combined length of prostomium and palps 7
- Median antenna distinctly shorter than combined length of prostomium and palps 10
- 7 Compound chaetae all with short, similar blades 8
- At least on anterior parapodia, some compound chaetae with distinctly longer blades than other chaetae, spiniger-like 9
- 8 Blades short, all similar in length; dorsal and ventral simple chaetae thick, bidentate, with teeth separated from each other *E. (P.) wilsoni* n.sp.
- Blades with usual dorsoventral gradation in length. Dorsal and ventral simple chaetae not unusually thick and teeth close to each other *E. (P.) sexoculata*
- 9 Spiniger-like blades, at least on anterior parapodia, more than 4 times length of falciger blades; dorsal cirri minute *E. (P.) tasmanica*
- Spiniger-like blades not so long; dorsal cirri larger *E. (P.) gambiae*
- 10 Antennae inserted on posterior margin of prostomium. Lateral antennae and dorsal cirri minute *E. (P.) caribensis*
- Antennae inserted on anterior margin of prostomium. Lateral antennae and dorsal cirri not unusually small *E. (P.) homosetosa*

***Exogone* (*Parexogone*) *exmouthensis*
Hartmann-Schröder, 1980**

Figs. 62A–G, 69E

Exogone exmouthensis Hartmann-Schröder, 1980a: 57, figs. 45, 46; 1992a: 60, figs. 18–20.Not *Exogone* (*Parexogone*) *exmouthensis*.—San Martín, 1991a: 726.**Material examined.** AUSTRALIA: SOUTH AUSTRALIA. 2 specimens, AM W26633, Fifth Creek, Port Pirie, Spencer Gulf, 33°12'S 137°55'E, *Posidonia* in subtidal region, 2.8 m, T.J. Ward, Mar 1980. 1 specimen, AM W26661, off Fifth Creek, Port Pirie, Spencer Gulf, 33°12'S 137°55'E, *Posidonia* & *Amphibolus* spp. in subtidal region, 4.6 m, T.J. Ward, Aug 1979. WESTERN AUSTRALIA. 1 specimen, AM W27022, Goss Passage,Beacon Island, 28°25.5'S 113°47.0'E, dead plates of *Acropora* covered in coralline algae, 20 m, P.A. Hutchings, 20 May 1994. 2 specimens, AM W27023, southeast end of Long Island, Beacon Island, 28°28.8'S 113°46.5'E, dead coral embedded in calcareous substrate, 30 m, P.A. Hutchings, 22 May 1994. 2 specimens, AM W27024, East Montalivet Island, 15°06'S 125°18'E, 6 m, P.A. Hutchings, 16 July 1988. 3 specimens, AM W27427, inshore reef off Ned's Camp, Cape Range National Park, 21°59'S 113°59'E, frilly *Caulerpa* sp., 1 m, J.K. Lowry, 2 Jan 1984. 1 specimen, and 2 specimens on SEM stub, AM W27439, north end of beach, Bundegi Reef, Exmouth Gulf, 21°49'S 114°11'E, rocky rubble, coralline algae with green epiphyte, 2 m, H.E. Stoddart, 4 Jan 1984. 1 specimen, AM W27451, Lafontaine Island, Kimberley region, 14°10'S 125°47'E, 15 m, P.A. Hutchings, 19 July 1988. 3 specimens, and 1 specimen on SEM stub, AM W27458, limestone reef, off Ned's camp, Cape Range National Park, 21°59'S 113°55'E, sponge with epiphytic algae, and muddy worm tubes, 1.5 m, R.T. Springthorpe, 2 Jan 1984. 1 specimen, AM W27461, north end of beach, Bundegi Reef,

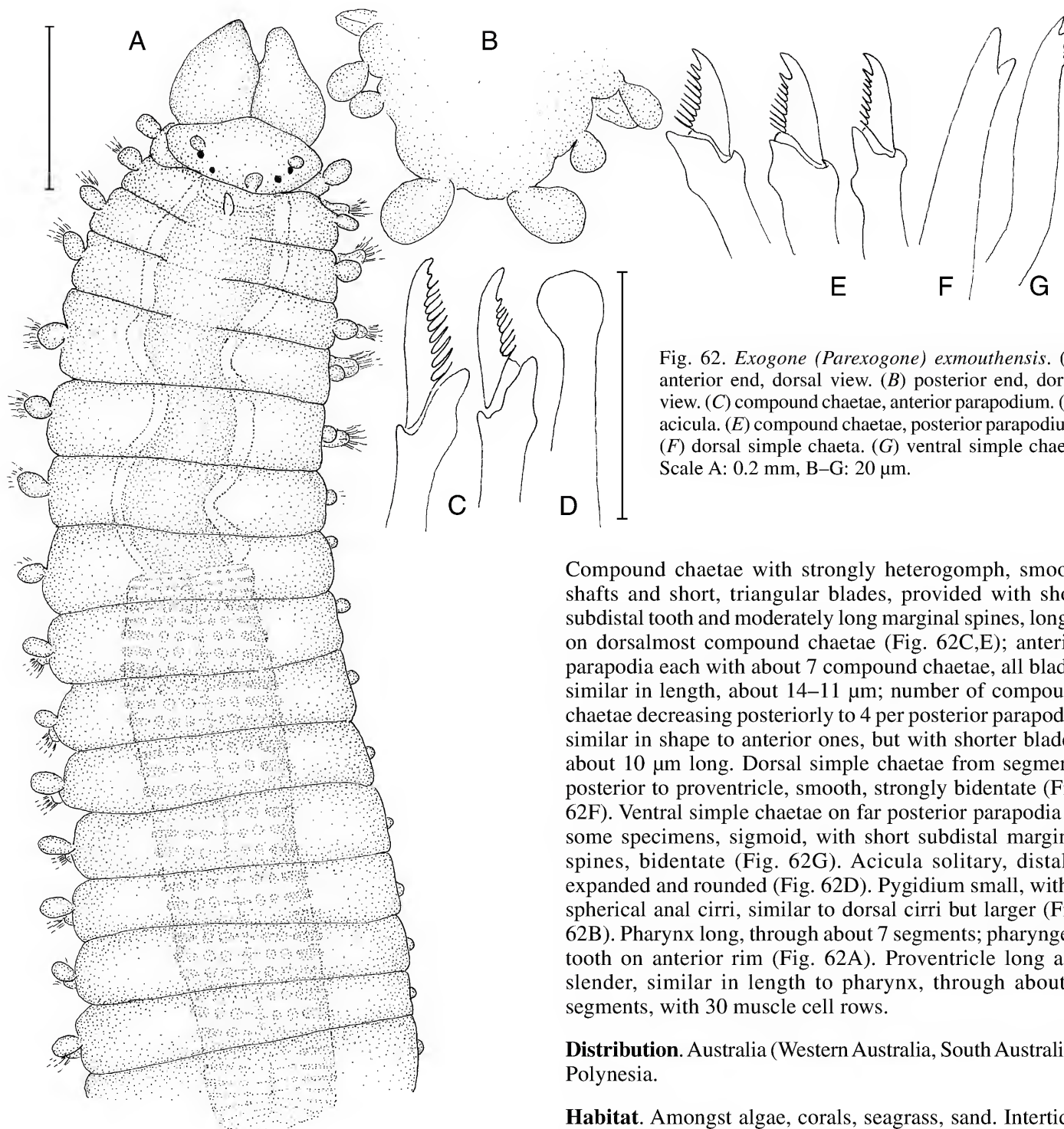


Fig. 62. *Exogone (Parexogone) exmouthensis*. (A) anterior end, dorsal view. (B) posterior end, dorsal view. (C) compound chaetae, anterior parapodium. (D) acicula. (E) compound chaetae, posterior parapodium. (F) dorsal simple chaeta. (G) ventral simple chaeta. Scale A: 0.2 mm, B–G: 20 µm.

Compound chaetae with strongly heterogomph, smooth shafts and short, triangular blades, provided with short subdistal tooth and moderately long marginal spines, longer on dorsalmost compound chaetae (Fig. 62C,E); anterior parapodia each with about 7 compound chaetae, all blades similar in length, about 14–11 µm; number of compound chaetae decreasing posteriorly to 4 per posterior parapodia, similar in shape to anterior ones, but with shorter blades, about 10 µm long. Dorsal simple chaetae from segments posterior to proventricle, smooth, strongly bidentate (Fig. 62F). Ventral simple chaetae on far posterior parapodia of some specimens, sigmoid, with short subdistal marginal spines, bidentate (Fig. 62G). Acicula solitary, distally expanded and rounded (Fig. 62D). Pygidium small, with 2 spherical anal cirri, similar to dorsal cirri but larger (Fig. 62B). Pharynx long, through about 7 segments; pharyngeal tooth on anterior rim (Fig. 62A). Proventricle long and slender, similar in length to pharynx, through about 8 segments, with 30 muscle cell rows.

Distribution. Australia (Western Australia, South Australia). Polynesia.

Habitat. Amongst algae, corals, seagrass, sand. Intertidal to about 30 m depth.

Exmouth Gulf, 21°49'S 114°11'E, rocky rubble, brown algae with epiphytes, sediment, 2 m, H.E. Stoddart, 4 Jan 1984. 1 specimen, AM W27463, 5 km offshore, Bush Bay, 30 km south of Carnarvon, 25°10'S 113°39'E, airlift in strap-leaved seagrass beds, 2 m, J.K. Lowry and R.T. Springthorpe, 6 Jan 1984.

Description. Body long and slender, filiform, 6.4 mm long, 0.4 mm wide, about 74 chaetigers. Prostomium ovate, wider than long, with 4 small eyes in trapezoidal arrangement and, sometimes, 2 minute anterior eyespots; antennae papilli-form, sphaerical, minute; median antenna slightly larger than lateral antennae, inserted between posterior eyes, lateral antennae inserted in front of anterior eyes. Palps long and broad, dorsally fused except for a distal deep notch (Fig. 62A, 69E). Peristomium covered by chaetiger 1 dorsally; tentacular cirri egg-shaped, larger than antennae. Dorsal cirri on all parapodia, similar to tentacular cirri (Figs. 62A, 69E).

Exogone (Parexogone) penelopeae n.sp.

Fig. 63A–L

Material examined. AUSTRALIA: SOUTH AUSTRALIA. HOLOTYPE: AM W26410, Elliston Reef, 33°39'S 134°53'E, algae, P.A. Hutchings, 11 Mar 1979. NEW SOUTH WALES. PARATYPES: 2 specimens, AM W26411, northern side of Bannister Head, 35°19.15'S 150°29.12'E, grey sponge from top of boulder, 18 m, K. Attwood, 6 May 1997.

Description. Body cylindrical, moderately long, holotype incomplete, 4 mm long, 0.31 mm wide, 46 chaetigers. Prostomium ovate to sub-pentagonal, wider than long; 4 large eyes in trapezoidal arrangement; median antenna inserted between posterior eyes, thick, cylindrical, similar in length to prostomium and palps together or slightly shorter; lateral antennae egg-shaped, ovate, much shorter

than median antenna, inserted in front of anterior eyes. Palps broad, slightly longer than prostomium, fused along their length, with a small dorsal distal furrow (Fig. 63A). Peristomium slightly shorter than following segments, covering dorsally posterior part of prostomium; tentacular cirri similar to lateral antennae but much smaller. Dorsal cirri on all segments, egg-shaped, larger than tentacular cirri but smaller than lateral antennae, shorter than parapodial lobes (Fig. 63A). Compound chaetae including 2–4 on anterior parapodia, 1–2 in midbody and posterior parapodia, spiniger-like with elongate blades, bidentate, both teeth small and similar, and long, erect, fine marginal spines, distal spines longer than remaining, extending beyond tips of blades, blades 39 μm long on anterior parapodia (Fig. 63B), 36 μm on midbody (Fig. 63F), 26–23 μm on posterior parapodia (Fig. 63J), in addition with several falcigers, 8 on anterior parapodia, 4–5 on midbody, 3–4 on posterior parapodia, with strongly bidentate blades, provided with long, erect marginal spines, longer on distal part, extending beyond tip, more strongly bidentate, with longer and thicker subdistal tooth posteriorly (Figs. 63C,G,K), slight dorsoventral gradation in length of blades on anterior parapodia, 18 μm above, 10 μm below, and all similar in length on remaining parapodia, about 16 μm on midbody, 12 μm on posterior parapodia. Dorsal simple chaetae from post-proventricular parapodia, bidentate, distal tooth small subdistal tooth long, provided with 6–7 thin, long, erect, spines (aristae) (Fig. 63H), disposed on a transverse inferior ridge (Fig. 63I). Ventral simple chaetae from about chaetiger

28 in holotype, sigmoid, similar to dorsal simple chaetae, but thicker, major difference in size of teeth, with only 2 aristaes, proportionally shorter than those of dorsal simple chaetae (Fig. 63L). Anterior parapodia each with 2 aciculae, one straight and one bent laterally (Fig. 63D); remaining parapodia each with solitary acicula, distally expanded and rounded (Fig. 63E). Pharynx moderate in length, through about 5–6 segments; pharyngeal tooth conical, on anterior rim (Fig. 63A). Proventricle short, through 3 segments, with 17 muscle cell rows.

Remarks. This species is characterized by having several aristaes on dorsal and ventral simple chaetae, compound chaetae with strongly bidentate blades, provided with long spines and subdistal tooth slightly longer than distal tooth, as well as short, egg-shaped lateral antennae and relatively short median antenna; no other species has these combinations of characters.

Distribution. Australia (New South Wales, South Australia, Western Australia).

Habitat. On sponges and algal washings, up to 18 m depth.

Etymology. The species is named in honour of Dr Penelope (Penny) Berents, of The Australian Museum.

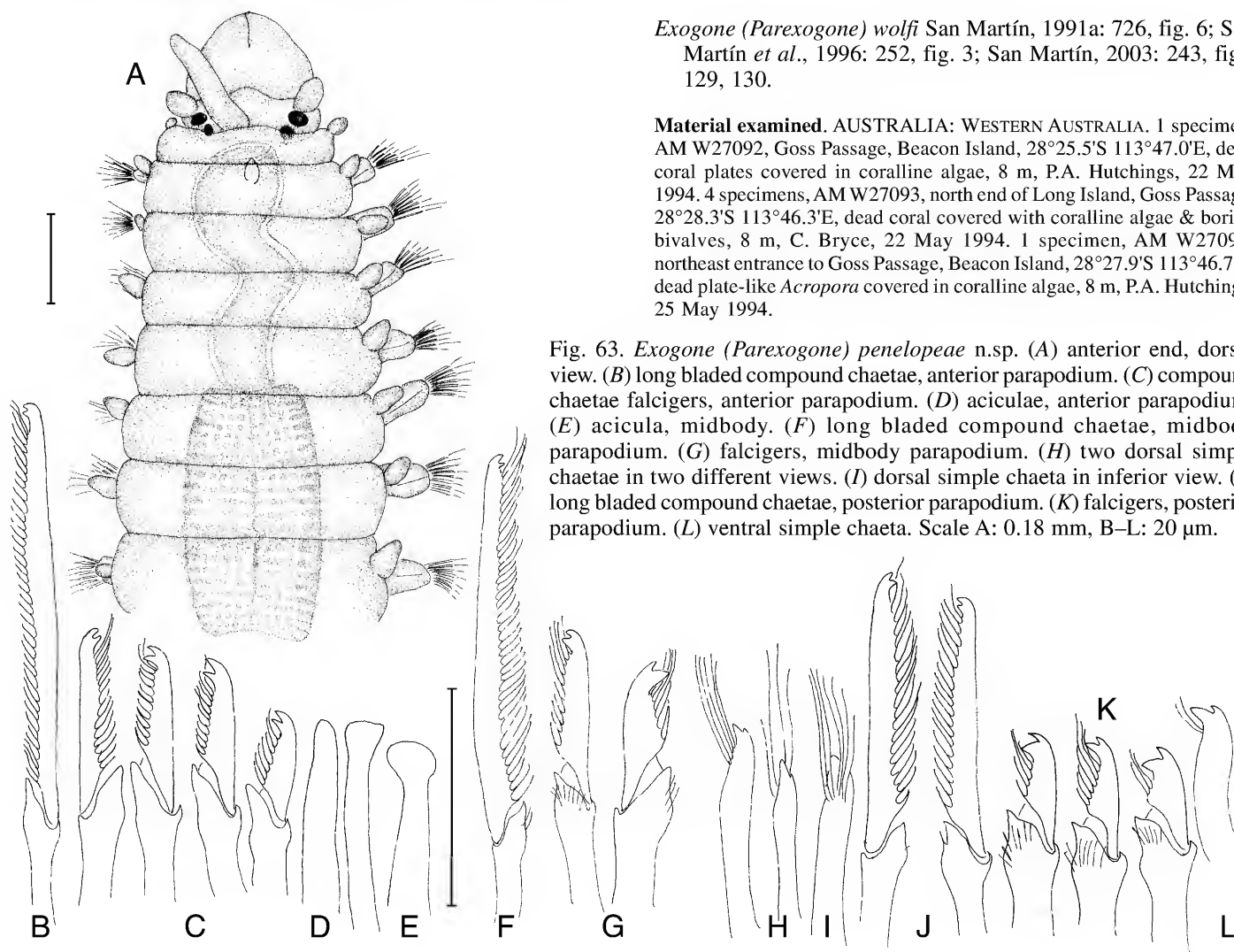
Exogone (Parexogone) wolffi San Martín, 1991

Fig. 64A–J

Exogone (Parexogone) wolffi San Martín, 1991a: 726, fig. 6; San Martín *et al.*, 1996: 252, fig. 3; San Martín, 2003: 243, figs. 129, 130.

Material examined. AUSTRALIA: WESTERN AUSTRALIA. 1 specimen, AM W27092, Goss Passage, Beacon Island, 28°25.5'S 113°47.0'E, dead coral plates covered in coralline algae, 8 m, P.A. Hutchings, 22 May 1994. 4 specimens, AM W27093, north end of Long Island, Goss Passage, 28°28.3'S 113°46.3'E, dead coral covered with coralline algae & boring bivalves, 8 m, C. Bryce, 22 May 1994. 1 specimen, AM W27094, northeast entrance to Goss Passage, Beacon Island, 28°27.9'S 113°46.7'E, dead plate-like *Acropora* covered in coralline algae, 8 m, P.A. Hutchings, 25 May 1994.

Fig. 63. *Exogone (Parexogone) penelopeae* n.sp. (A) anterior end, dorsal view. (B) long bladed compound chaetae, anterior parapodium. (C) compound chaetae falcigers, anterior parapodium. (D) aciculae, anterior parapodium. (E) acicula, midbody. (F) long bladed compound chaetae, midbody parapodium. (G) falcigers, midbody parapodium. (H) two dorsal simple chaetae in two different views. (I) dorsal simple chaeta in inferior view. (J) long bladed compound chaetae, posterior parapodium. (K) falcigers, posterior parapodium. (L) ventral simple chaeta. Scale A: 0.18 mm, B–L: 20 μm .



Description. Body long, slender, filiform, 8 mm long, 0.12 mm wide, 53 chaetigers. Prostomium nearly rounded; 2 pairs of small eyes in trapezoidal arrangement and 2 minute anterior eyespots. Median antenna inserted in front of line between posterior eyes, cylindrical, 1.5 times as long as combined length of prostomium and palps; lateral antennae much shorter than median antenna, slightly shorter than prostomium, inserted in front of anterior eyes (Fig. 64A). Palps longer than prostomium, completely fused all along their length, forming a triangular, acute piece. Peristomium similar to immediately following segments, rectangular in shape; tentacular cirri minute, papilliform. Segments posterior to proventricle longer than wide (Fig. 64A). Dorsal cirri papilliform, elongate, shorter than parapodial lobes, present on all parapodia. Compound chaetae with smooth shafts or provided with long, thin subdistal spines, and

including on each parapodium chaetae with elongate, spiniger-like, bidentate blades, both teeth small and similar (Fig. 64B,E), those of posterior parapodia with subdistal tooth slightly longer than distal one (Fig. 64K), provided with long, thin, erected marginal spines, those of distal part even longer, extending beyond tip, together with several falcigers, similar in shape to spiniger-like, but shorter (Figs. 64C,F,I). Anterior parapodia each with 1–2 spiniger-like chaetae, blades about 40 μm long (Fig. 64B), and about 10 falcigers (Fig. 64C) with dorsoventral gradation in length, 23 μm above, 12 μm below; progressively to midbody, blades longer; midbody parapodia each with 1 spiniger-like chaeta (Fig. 64E), blade about 54 μm long, and 5–6 falcigers (Fig. 64F), blades 24 μm above 14 μm below; posterior parapodia each with 1 spiniger-like chaeta much shorter than those of midbody (Fig. 64K), 28 μm long, and only 2–3 falcigers, with subdistal tooth slightly longer than distal tooth (Fig. 64I), blades 12 μm above 9 μm below. Dorsal simple chaetae from midbody, distinctly bidentate, provided with several long marginal spines (aristae), extending beyond tip (Fig. 64D), thicker and more strongly bidentate on posterior parapodia (Fig. 64H). Ventral simple chaetae on posterior parapodia, strongly bidentate, subdistal tooth slightly longer than distal tooth, provided with moderately long, thin subdistal marginal spines (Fig. 63J). Acicula

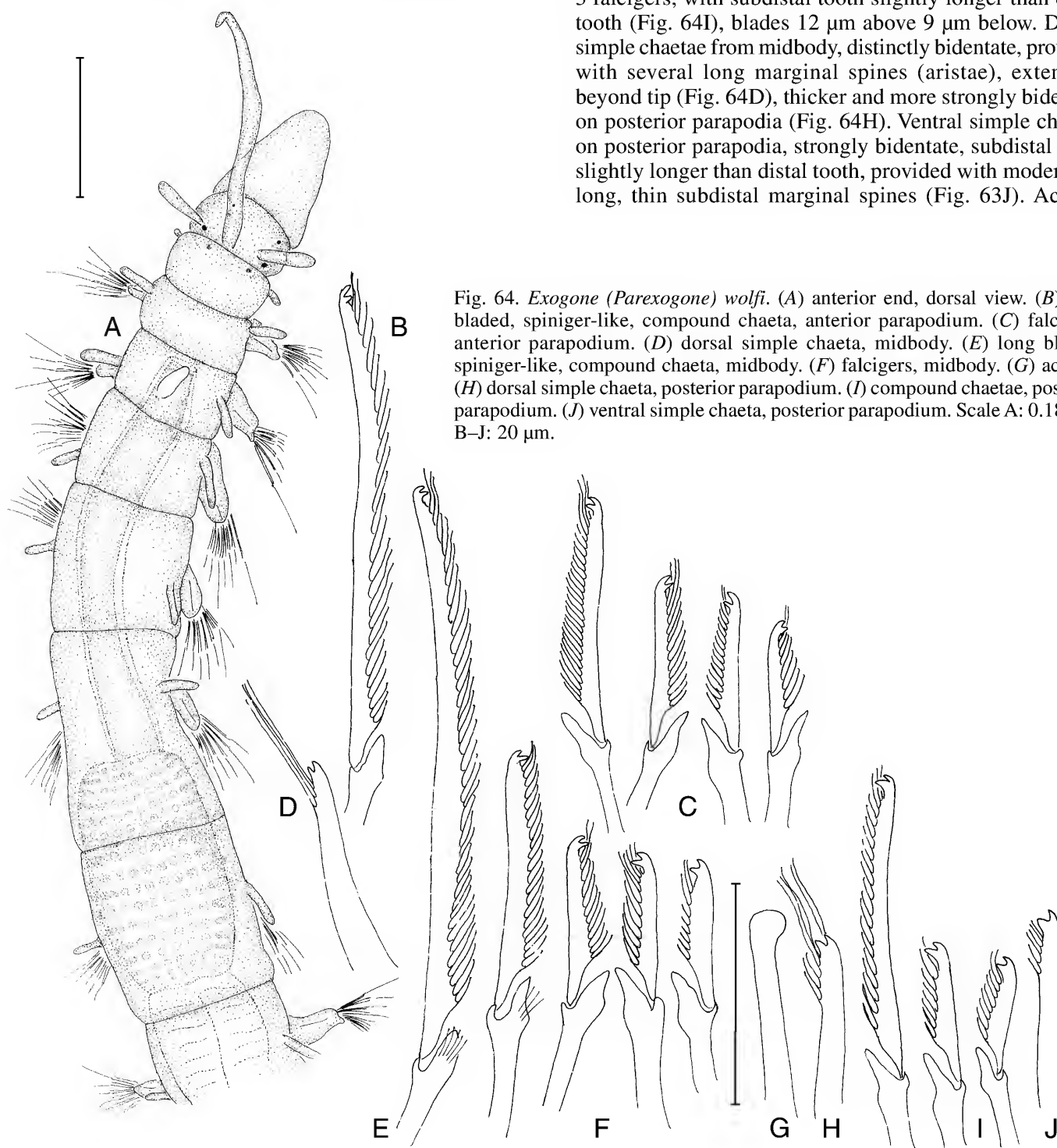


Fig. 64. *Exogone (Parexogone) wolfi*. (A) anterior end, dorsal view. (B) long bladed, spiniger-like, compound chaeta, anterior parapodium. (C) falcigers, anterior parapodium. (D) dorsal simple chaeta, midbody. (E) long bladed, spiniger-like, compound chaeta, midbody. (F) falcigers, midbody. (G) acicula. (H) dorsal simple chaeta, posterior parapodium. (I) compound chaetae, posterior parapodium. (J) ventral simple chaeta, posterior parapodium. Scale A: 0.18 mm, B–J: 20 μm .

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Introduction

The family Syllidae was established by Grube (1850), and the origin of the name comes from the Latin name *Syllis*, meaning “a worm” (Brown, 1956).

This family is one of the most diverse of the Class Polychaeta (Annelida), represented by about 670 species belonging to 55 genera, but new taxa are still being described. General accounts on the family Syllidae have been given by Glasby (2000), Rouse & Pleijel (2001) and San Martín (2003). Syllids are common on all shallow substrates, but less common at depth, with some species symbiotic or parasitic on other marine invertebrates (Martín & Britayev, 1998).

The family Syllidae is currently divided into 4 subfamilies: Eusyllinae Malaquin, 1893; Exogoninae Langerhans, 1879; Autolytinae Langerhans, 1879; and Syllinae Grube, 1850. Although the names of the subfamilies are usually attributed to Rioja (1925), these names were previously used as *tribu* Exogoneae, *tribu* Autolyteae, and *tribu* Syllinae by Langerhans (1879); subsequently, Malaquin (1893) erected the subfamily Eusyllinae. Fauvel (1923) and later Rioja (1925) designated them as subfamilies. A recent discussion on the authority of each subfamily is given by Ruíz-Ramírez & Salazar-Vallejo (2001). The subfamily classification is probably inadequate, and some more groups could be proposed (Garwood, 1991; San Martín, 2003); a cladistic analysis of the family is currently in preparation by the author.

Contributions to the Australian Syllidae have been made by Augener (1913, 1927), Haswell (1886, 1920a, 1920b), Fauvel (1917), Monro (1931), Day & Hutchings (1979), Hutchings & Rainer (1979, 1980), Hutchings & Murray (1984), San Martín & López (1998, 2003) and Hartmann-Schröder, who described and recorded many species of Syllidae in her papers of 1979, 1980a, 1981, 1982, 1983, 1984, 1985, 1986, 1987, 1989, 1990, and 1991, and recently Glasby (2000) and Glasby & Watson (2001).

In this paper, all species belonging to the subfamily Exogoninae, known from Australia are described and figured, and keys provided. Further papers will deal with the other subfamilies.

Characters

The members of the subfamily Exogoninae are small to minute worms (few mm long, about 2–7 mm long), usually found living in sand interstitially, in mud, in crevices on corals and rocks, amongst algae, and in most shallow substrates, but some occur at great depths. No species are parasitic or commensal with other invertebrates. Exogonines are usually short, with few segments (approximately 30) sometimes broad (Figs. 10A, 16A, 29A), but species of some genera, such as *Exogone* Örsted, 1845 are long, slender and filiform (Figs. 69A, 91A), with more segments (around 50). Like most syllids, they are dorsally arched, convex, ventrally flat or concave. Typically, members of this group lack colour markings, with the exception of some species of the genus *Salvatoria* that have transverse red bands on some segments. The palps are fused, but the degree of fusion varies; some species have palps totally fused to each other or leaving a small distal notch (Figs. 12A,B, 49B, 69B,C, 81B,E,F, 91C, 94B), whereas some species have palps with the basal two-thirds fused only (Figs. 10B, 41B,C, 58A, 59A, 60A). The genus *Nooralia* San Martín, 2002, has palps free except at base, but as all other characters agree with the current definition of this subfamily. *Nooralia* is here included as an exogonine but its systematic position is doubtful (see below). Most species of the genus *Salvatoria* have palps dorsally connected by a membrane (Fig. 14A). The exogonine prostomium bears 3 antennae, sometimes the antennae are absent (e.g., *Exogone acerata* San Martín & Parapar, 1990), 4-lensed eyes and, sometimes, in addition 2 small anterior eyespots (without lenses); eyes can be absent in some species and may no longer be visible after preservation. In this paper, one antenna is considered long if it is similar to combined length of prostomium and palps together or if it is longer, and short if it is shorter than the above defined length. The peristomium typically has two pairs of tentacular cirri (*Nooralia*, *Brania*, *Salvatoria*, *Cicese*). A single pair of tentacular (peristomial) cirri is found in some genera (*Parapionosyllis*, *Exogone*, *Sphaerosyllis*, *Prosphaerosyllis*, *Erinaceusyllis*). Sometimes, the

peristomium dorsally covers the posterior part of prostomium; in some species of the genus *Erinaceusyllis* there are 2 lateral wings that protect the nuchal organs (Figs. 41A–C), and in some species of *Prosphaerosyllis* the whole prostomium is retracted into the peristomium or even into anterior chaetigers (Figs. 17A, 19A,B, 26A, 27A,C). The nuchal organs are typical of the family Syllidae, 2 dorsolateral, densely ciliated grooves between the prostomium and peristomium (Figs. 5B,C, 12A, 69E, 81B,C), but some are laterally positioned (Fig. 94B), sometimes covered with two lips (Figs. 18C,D, 39E, 69B–D). The internal lobes of the nuchal organs (see Lewbart & Riser, 1996) may be visible, and surround the anterior end of the pharynx (Figs. 19A,B, 23A, 30A, 33A, 38A, 66A, 87A). The pharynx is straight, provided with either a conical tooth located on the anterior margin of the opening (*Brania*, *Parapionosyllis*, *Exogone*, *Sphaerosyllis*) or a more or less rhomboidal to oval tooth, usually located behind the anterior rim (*Salvatoria*, *Cicese*, *Prosphaerosyllis*, *Erinaceusyllis*), or in the middle of the pharynx (Figs. 13A, 15A, 17A, 19A,B, 21A, 37A). *Nooralia*, however, lacks a pharyngeal tooth and the proventricle is minute (Fig. 1A,B). The anterior margin of the pharynx is usually surrounded by a crown of soft papillae, and another smaller crown may also be visible, but most species of the genera *Salvatoria*, *Erinaceusyllis*, and *Prosphaerosyllis* lack papillae. The pharynx of Exogoninae is considered long if it extends through more than three segments (Figs. 1A, 4A, 8A, 9A, 17A, 23A, 37A, 62A, 77A, 78A), and short if it extends through three segments or less (Figs. 46A, 47A, 48A, 51A, 54A, 55A, 58A, 59A, 61A, 79A, 80A, 87A, 92A). A pharynx is considered as wide if it is about $\frac{1}{3}$ of the body width or more (see Figs. 4A, 6A, 8A, 9A, 15A, 17A, 21A, 23A, 24A, 37A), and slender if the width is less than $\frac{1}{3}$ of the body width (Figs. 43A, 44A, 46A, 47A, 48A, 50A, 51A, 52A, 54A, 59A, 60A, 61A). Similar proportions are used also for the proventricle. The proventricle of the species of the genera *Salvatoria*, *Prosphaerosyllis*, and *Erinaceusyllis* are distinctly ovoid to barrel-shaped, lacking the midline of cells (Figs. 4A, 8A, 14A, 15A, 17A, 19A, 23A, 24A, 30A, 31A, 32A, 33A, 34A, 35A, 36A, 37A, 38A, 40A) or indistinct (fig. 7A, 9A, 11A); in contrast, species of all other genera have a distinct, dorsal midline on the proventricle (Figs. 42A, 43A, 44A, 45A).

The parapodia are uniramous, with dorsal and ventral cirri. Some species lack dorsal cirri on chaetiger 2, but others within the same genus may have them. This character may be considered as neotenic, as juveniles may lack dorsal cirri on chaetiger 2 (and also lack dorsal tentacular cirri) whereas adults of the same species have dorsal cirri on chaetiger 2 (and also 2 pairs of tentacular cirri) (personal observations on *Brania pusilla*; San Martín, 1984a, 1991a, 2003). Some species may grow cirri on chaetiger 2 after leaving the female while some species do not. The number of pairs of tentacular cirri is considered to be a generic character: genera with two pairs are differentiated from genera with a single pair, which may be otherwise identical, as for example in *Brania* (2 pairs) and *Parapionosyllis* (1 pair), as well as in *Cicese* (2 pairs) and *Erinaceusyllis* (1 pair). Dorsal cirri, antennae and tentacular cirri of the Exogoninae, are typically short on all genera, but there is a difference in shape and size among the different genera, from the spindle-shaped, elongate cirri found in most species of *Salvatoria* (Figs.

4A, 5A,B, 9A), to the minute, papilliform cirri of *Exogone*. Herein, a cirrus is considered as long if it is distinctly longer than twice the length of the parapodial lobe (Figs. 4A, 7A, 8A, 9A, 11A, 13A), short if it is similar to parapodial lobe in length or shorter (Figs. 15A, 17A, 24A, 28A, 42A, 43A, 44A, 45A, 50A); some species of the genus *Exogone* have dorsal cirri minute, papilliform (Figs. 68A, 72A, 79A). *Brania* and *Parapionosyllis* have bowling-pin shaped cirri, those of *Sphaerosyllis* are onion or bottle shaped, and similar to those of *Prosphaerosyllis*, which sometimes have a distal, retractile, button-shaped cirrostyle (Figs. 15B, 16D, 28B, 29C); the cirri of *Cicese* and *Erinaceusyllis* appear to be similar to those of *Salvatoria*, but may be proportionally shorter, sometimes similar to those of *Sphaerosyllis*.

Usually few neurochaetae are present per parapodium, but some species may have up to 15 on each anterior parapodium. The typical arrangement on each parapodium is one simple dorsal, capillary chaeta, several compound heterogomph (sometimes hemigomph) compound chaetae, and one simple ventral, capillary chaeta (Fig. 49F). Dorsal simple chaetae may be present from chaetiger 1 but are usually first present from midbody segments. Simple ventral chaetae are usually only present on posterior parapodia, although they may be absent. Both dorsal and ventral simple chaetae can be provided with some long, thin spines, named arista. A simple chaeta is considered as thick when the width is similar to those of the shafts of the compound chaetae or larger (Figs. 65G, 66E,H, 67E,G, 80H,K). The blades may be short, less than about 10–12 μm (Figs. 15D, 17C, 21H, 38E, 42H, 46E, 50G, 66D, 72D, 74F, 78) or long (more than 12 μm); some blades may be elongate, distinctly longer than wide (Figs. 7B, 30D, 31B, 33C, 64E, 65D, 72G, 79E, 83F, 89G).

Each parapodium usually bears a single acicula, sometimes 2 on anteriormost parapodia. The aciculae of the members of the subfamily Exogoninae are of 3 main types: distally rounded, sometimes with a hollow appearance at the tip (Figs. 59I, 62D), such as in the genera *Brania*, *Exogone*, and *Parapionosyllis*; or distally enlarged, with a distal, oblique, filiform tip (acuminate) (Figs. 4G, 7D, 11G, 19F, 30E, 34E, 40H), typical of *Nooralia*, *Salvatoria*, *Cicese*, *Erinaceusyllis* and *Prosphaerosyllis*, or distally forming a right angle (Figs. 47I, 48H, 54D, 55H), which are typical of *Sphaerosyllis*.

Members of the genera *Cicese*, *Sphaerosyllis*, *Erinaceusyllis*, and *Prosphaerosyllis* are provided with dorsal and ventral papillae, which may be numerous, and often present on cirri and parapodia (Figs. 16A–D, 17A,B, 25D–F, 29A,B, 39D, 41A–D, 49A–D, 53, 56B,D,F,G); debris often adheres to these papillae and camouflages the animal within the sediment (Haswell, 1920a; Riser, 1991).

Reproduction

Three reproductive methods have been described: dorsal incubation of eggs by means of capillary notochaetae on the females (Kuper & Westheide, 1998) as reported in the recently described genus *Cicese* (Díaz-Castañeda & San Martín, 2001), *Salvatoria* (Figs. 5A,D, 10A, 12C,D), *Prosphaerosyllis* (Figs. 18E,F, 20A,F), and *Erinaceusyllis* n.gen. (Fig. 39B,C) or by means of compound notochaetae (*Nooralia*) (Fig. 3A–D), ventral incubation of eggs and development of attached juveniles in the genera *Brania*,

Parapionosyllis, *Exogone* (Figs. 91B, 94C,D), and *Sphaerosyllis* (Fig. 56A–E), and viviparity (reported in some species of *Exogone* (*Paraxogone*), Pocklington & Hutchenson, 1983; San Martín, 1991a). All these methods demonstrate parental care of eggs and also sometimes of juveniles, which is a typical biological adaptation to interstitial life (Westheide, 1984; 1987). In both dorsal and ventral brooding, the mature males are provided with long, thin, natatory notochaetae (Figs. 18A, 25A,C, 39A, 49A, 91A). Recent discussion on methods of reproduction of the Syllidae are in Garwood (1991) and Franke (1999) and additional information is given by Westheide (1974), Perkins (1981), San Martín (1984a, 1991a, 2002, 2003), and Kudenov & Harris (1995).

In the case of dorsal brooding, larvae emerge from the eggs once embryonic development is completed; Kisseleva (1986) demonstrated for *S. clavata* that larvae emerge from eggs with 3 segments; both adult males and females have notochaetae during the reproductive period. In the case of ventral brooding, however, larvae develop into juveniles that only leave the female's body when fully developed, and only males usually develop natatory notochaetae. It is possible that the female feeds these juveniles through an internal connection, as large juveniles can still be attached to the maternal body; the juveniles are attached to the female by their anus, connecting directly to the mother through dilated nephridial pores (Fig. 91B). This supposition would be an interesting topic of future research. Viviparity could be considered as an extreme case of protection of juveniles.

In the study of the Australian material, I have observed dorsal brooding in the species *Nooralia bulgannabooyanga* (by means of compound notochaetae), *Salvatoria kerguelensis*, *Salvatoria quadrioculata*, *S. longisetosa*, *S. eurtimica*, *S. koorineclavata* n.sp., *Erinaceusyllis hartmannschroederiae* n.sp., *E. serratosetosa*, *E. ettiennei* n.sp., *E. opisthoculata*, *Prosphaerosyllis longipapillata*, *P. papillosissima*, *P. sexpapillata*, *P. magnoculata*, and *P. nathani*. Observations on ventral brooding, with ventral attachment and development of juveniles have been made in *Exogone heterosetosa*, *E. africana*, *E. fustifera*, *E. naidinoides*, *Sphaerosyllis densopapillata*, *S. lateropapillata*, and *S. hirsuta*.

Systematic implications of the type of reproduction

Kuper & Westheide (1998) and Franke (1999) consider that dorsal or ventral attachment position is species-specific, and that both conditions can be found within a single genus; my observations, however, contradict this proposal. After examining thousands of specimens of Exogoninae from all around the world, I have found that all species of some genera brood dorsally (*Salvatoria*, *Prosphaerosyllis*, *Erinaceusyllis* and the recently described genus *Cicese*); others brood ventrally, and attach developing juveniles (*Brania*, *Parapionosyllis*, *Exogone*, *Sphaerosyllis*). Dorsal brooding requires the development of capillary notochaetae to attach the eggs, but how the eggs exit the body is unknown; probably capillary notochaetae are already attached to the membrane of each egg as it exits the body wall. Ventral brooding requires the development of glands that produce adhesive secretions and these females usually lack notochaetae; it is difficult to accept that such strong

morphological differences associated with these different methods of egg protection occurs in closely related species. Furthermore, both kinds of brooding have been reported from species belonging to the subfamily Eusyllinae, ventral brooding in the genus *Syllides* (Heacox & Schröder, 1978) and some species belonging to the complex of genera known as *Pionosyllis* (the species *Typosyllis longisetosa* Hartmann-Schröder, 1990 that belong to this complex, personal observations) and *Pionosyllis augeneri* (Hartmann-Schröder, 1979, personal observations), and dorsal brooding in *Pionosyllis pulligera* (Pierantoni, 1905; Augener, 1913); brooding in the Eusyllinae, however, appears to have a different origin than in the Exogoninae. The ventral brooding in the Eusyllinae does not develop juveniles and the dorsal brooding of *P. pulligera* is made on the dorsal cirri, developing attached juveniles on these cirri.

One interpretation is that brooding of eggs evolved independently in two groups, and these two groups progressively adapted to an interstitial life, independently evolving fused palps, reduced body size and dorsal cirri, and even loss of dorsal pair of tentacular cirri in some genera. Well-developed attached juveniles of *Brania pusilla*, lack dorsal tentacular cirri and dorsal cirri on chaetiger 2, although the adults have two pairs of tentacular cirri and dorsal cirri on all parapodia (personal observations; San Martín, 1984a). As explained above, some species may develop these cirri in a final stage of juvenile development while others species do not.

If one accepts this interpretation, the Exogoninae is not a monophyletic group, but includes two sister clades of the Eusyllinae whose adaptations to an interstitial life (in sand, crevices in rocks and corals) produced apparently similar genera with similar bodies. This similarity may be considered more as the result of a "process of exogonization" of two Eusyllinae branches, than evolution of differences within one subfamily Exogoninae. Therefore, one group consists of *Salvatoria* and *Cicese*, and perhaps *Nooralia*, which broods dorsally by means of egg attachment to notochaetae, and the other group composed of *Brania*, *Parapionosyllis* and *Exogone*, which broods ventral developing juveniles. Recently, Mastrodonato *et al.* (2003) made a detailed study of the external gestation of *Exogone naidina* and came independently to similar conclusions.

The genus *Sphaerosyllis*, as usually accepted, has species that brood dorsally and others that brood ventrally developing juveniles (Riser, 1991). This genus appears to contradict the above hypothesis. However, the species *Sphaerosyllis hystrix* and other related species that have a small proventricle, a conical pharyngeal tooth located on anterior rim of pharynx, and usually parapodial glands, brood ventrally and develop juveniles (included in the subgenus *Sphaerosyllis* by San Martín, 1984b). In contrast, species belonging to the subgenus *Prosphaerosyllis* San Martín, 1984 as well as the species of the "erinaceus" group, brood dorsally by means of capillary notochaetae (personal observations; Imajima, 1966 for *S. erinaceus*). For this reason, together with the morphological differences, the genus *Erinaceusyllis* is erected here for the species of the "erinaceus" group and the subgenus *Prosphaerosyllis* is raised to generic level. Both these genera are to be considered phylogenetically separate from *Sphaerosyllis*, although morphologically similar in appearance.

Material and methods

The material examined was mainly from the collections in The Australian Museum, and was collected by many people including: N. Coleman, W.F. Ponder, S. Shepherd, S. Slack-Smith, G. Wilson, H. McHail, J.C. Verco, B. Duchworth, J.K. Lowry, R.T. Springthorpe, H.E. Stoddart, P.A. Hutchings, A. Murray, S. Dittmann, J. Kudenov, T.J. Ward, P.C. Young, A. Jones, and others. Also, material from the Museum of Victoria (MV) have been studied, mostly collected by N. Coleman, S. Rainer, and others.

Material from the Zoologisches Museum of Hamburg (HZM), collected and identified by Hartmann-Schröder, has been re-examined, and some specimens donated by N.W. Riser.

Most of material was identified while on a Visiting Fellowship at The Australian Museum, but some identifications and the preparation of manuscript were made at the Universidad Autónoma de Madrid, Spain.

The specimens are mostly preserved in 70% ethanol after fixation in formalin. Examinations were made using a compound microscope with interference contrast optics (Nomarsky). Drawings were made using a camera lucida drawing tube. Scanning Electron Microscope observations and photographs were made in the SIDI (Servicio

Interdepartamental de Investigación) of the Universidad Autónoma de Madrid, Spain.

Information about Aboriginal words for the names of several new taxa was obtained from Endacott (1973). The order of descriptions, both for genera and for species in each genus, follows the order of apparition in the respective keys.

The following abbreviations have been used in the text: AM Australian Museum, Sydney; MV Museum of Victoria, Melbourne; HZM Hamburgische Zoologische Museum, Hamburg, Germany.

Some structures (e.g., nuchal organs or eyespots) are difficult to see. They are described only when they were examined, but they also are present on all species although they are not described in the respective sections.

Taxonomy

Key to genera of Australian Exogoninae

Two generic keys are given; one is based on reproductive and morphological characters, and the other based only on morphological characters. The order followed for descriptions is that of the first key. The order of description of species is that of the corresponding keys of each genus.

Key based on reproductive and morphological characters

- | | | |
|---|--|------------------------------|
| 1 | Females brooding dorsally | 2 |
| — | Females brooding ventrally, developing juveniles, or viviparous | 5 |
| 2 | Brooding by means of compound notochaetae. Proventricle minute. Without pharyngeal tooth | <i>Nooralia</i> |
| — | Brooding by means of simple, capillary notochaetae. Proventricle long and wide. Pharyngeal tooth present, usually oval to rhomboidal | 3 |
| 3 | Body smooth; two pairs of tentacular cirri. Antennae and dorsal cirri long | <i>Salvatoria</i> |
| — | Body with papillae; single pair of tentacular cirri. Dorsal cirri usually short | 4 |
| 4 | Some dorsal cirri with a retractile cirrostyle. Antennae short. Pharynx relatively long and wide; pharyngeal tooth usually located far from anterior margin. Compound chaetae always with short, unidentate blades | <i>Prosphaerosyllis</i> |
| — | Antennae and dorsal cirri more or less elongate, without distal cirrostyle. Pharynx relatively slender; pharyngeal tooth usually located near anterior margin. Compound chaetae with elongate blades, bidentate, unidentate and bidentate, or unidentate | <i>Erinaceusyllis</i> n.gen. |
| 5 | Body smooth | 6 |
| — | Body covered with papillae | <i>Sphaerosyllis</i> |
| 6 | Two pairs of tentacular cirri | <i>Brania</i> |
| — | Single pair of tentacular cirri | 7 |
| 7 | Palps fused on the basal half to $\frac{3}{4}$. Dorsal cirri bowling-pin shaped. Distinct parapodial glands | <i>Parapionosyllis</i> |
| — | Palps usually fused all along their length or with terminal notch. Dorsal cirri small, papilliform. Parapodial glands indistinct or minute, apparently absent | <i>Exogone</i> |

Key based exclusively on morphological features

- 1 Two pairs of tentacular cirri 2
 — Single pair of tentacular cirri 4
- 2 Palps free from each other, except most basally. Proventricle minute. Pharyngeal tooth absent *Nooralia*
 — Palps fused at least on basal half. Proventricle distinct. Pharyngeal tooth present 3
- 3 Palps fused on basal half to $\frac{2}{3}$. Dorsal cirri bowling-pin shaped or truncate. Parapodial glands distinct, sometimes inside dorsal cirri. Acicula distally rounded, apparently hollow at tip. Pharynx slender, with distal soft papillae. Pharyngeal tooth conical, located at opening *Brania*
 — Palps joined all along their length or mostly by a dorsal membrane. Dorsal cirri spindle-shaped, usually elongate. Parapodial glands absent. Acicula acuminate. Pharynx and proventricle long and wide; usually without papillae on pharyngeal opening. Pharyngeal tooth rhomboidal to ovate, usually located far from pharyngeal opening *Salvatoria*
- 4 Body without papillae 5
 — Body papillate 6
- 5 Palps fused on basal half to $\frac{2}{3}$. Dorsal cirri bowling-pin shaped. Parapodial glands distinct. Dorsal simple chaetae distally serrated *Parapionosyllis*
 — Palps usually fused all along their length or with a distal, short notch. Dorsal cirri small, papilliform. Parapodial glands indistinct. Dorsal simple chaetae otherwise *Exogone*
- 6 Prostomium with 4 eyes, without eyespots. Proventricle short, with few large muscular bands. Pharynx slender; pharyngeal tooth small, conical, located on anterior rim on pharynx. Antennae and dorsal cirri flask- to onion-shaped. Acicula distally with tip forming a right angle *Sphaerosyllis*
 — Four eyes and 2 anterior eyespots on prostomium. Proventricle barrel-shaped, long and relatively wide, with numerous, slender muscular bands. Pharynx relatively large. Acicula acuminate 7
- 7 Pharynx distinctly wide, without papillae. Pharyngeal tooth rhomboidal to oval, long, usually located far from anterior rim. Antennae and dorsal cirri similar to *Sphaerosyllis*, but typically having an elongate cirrophore and a retractile cirrostyle. Compound chaetae always with short, unidentate falcigers *Prosphaerosyllis*
 — Pharynx proportionally more slender, sometimes with soft papillae surrounding opening. Pharyngeal tooth small, located near anterior rim. Antennae and dorsal cirri elongate, but sometimes similar to those of *Sphaerosyllis*, always without retractile cirrostyle. Compound chaetae usually with elongate blades bidentate, bidentate and unidentate, or unidentate *Erinaceusyllis* n.gen.

Genus *Nooralia* San Martín, 2002

Nooralia San Martín, 2002: 333.

Type species. *Nooralia bulgannabooyanga* San Martín, 2002.

Diagnosis. Body small, short, with about 30 chaetigers. Surface of body smooth. Prostomium with 4 eyes and 3 antennae. Palps fused at bases. Two pairs of tentacular cirri. Antennae, tentacular cirri and dorsal cirri of chaetiger 1 long, cylindrical to spindle-shaped; remaining dorsal cirri

short, lanceolate. Parapodia with dorsal simple capillary chaetae and compound chaetae with unidentate and bidentate short blades. Ventral simple chaetae apparently absent. Pharynx long, unarmed, with a crown of soft papillae on anterior rim. Proventricle small, difficult to see. Pygidium with 2 large anal cirri. Females brooding eggs dorsally, by means of compound notochaetae.

Remarks. The relationship of *Nooralia* to other members of the group is difficult to elucidate, because the genus displays features that differentiate it from all other

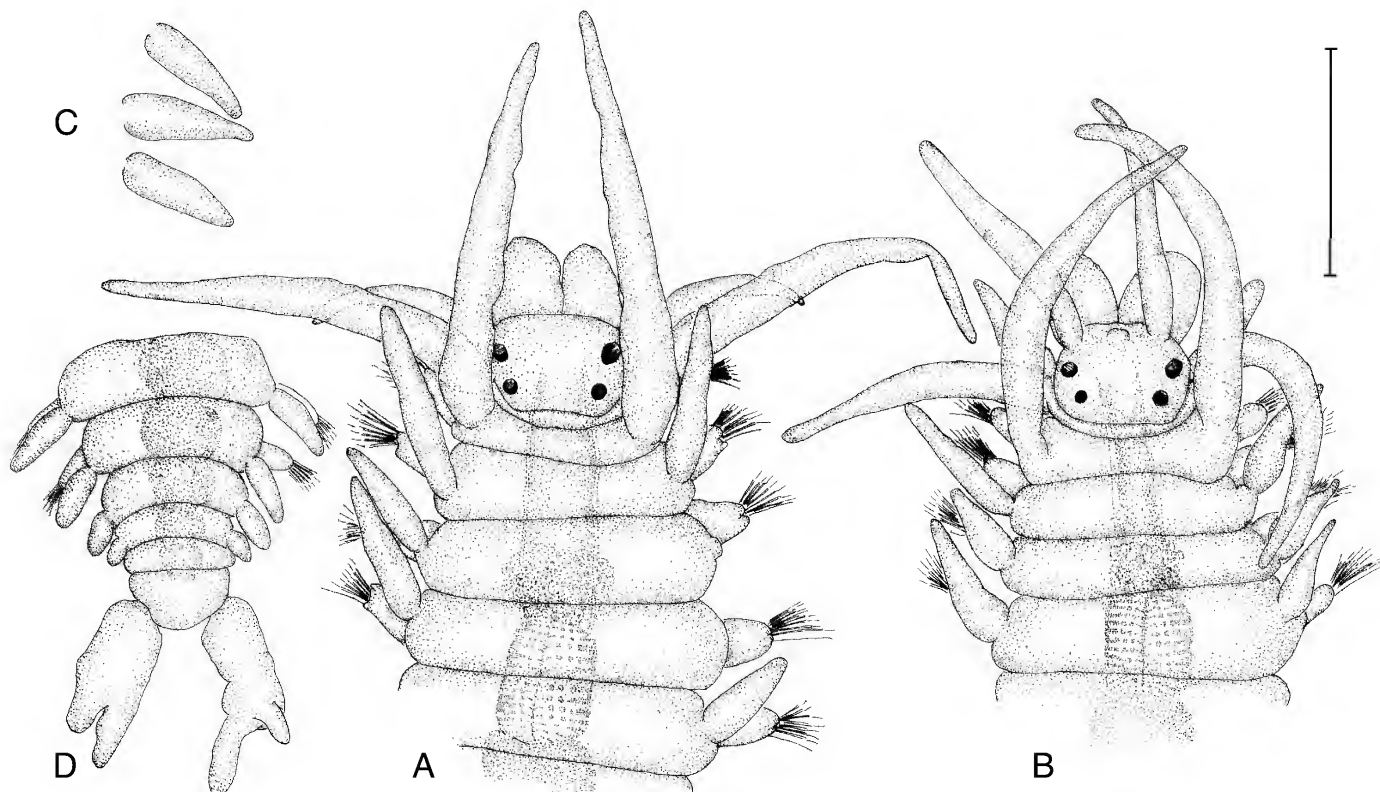


Fig. 1. *Nooralia bulgannabooyanga*. (A) anterior end, dorsal view, holotype (antennae missing). (B) anterior end, dorsal view, a paratype (median antenna missing). (C) alternative dorsal cirri, midbody, holotype. (D) posterior end, dorsal view, a paratype. Scale 0.09 mm.

Exogoninae genera, such as an indistinct proventricle and absence of a pharyngeal tooth. Characters such as the shape of the dorsal cirri, smooth dorsal surface and dorsal brooding of egg, as well as the shape of the aciculae of the single

known species, suggest that it may be related to the genus *Salvatoria*. However, *Salvatoria* has palps fused by means of a dorsal membrane and a distinctly massive proventricle, which is long and large, and has a pharyngeal tooth. Furthermore, the compound chaetae of *Nooralia* are different to those of all other species of the genera included in the Exogoninae. The genus appears to have an isolated position in the Syllidae.

***Nooralia bulgannabooyanga* San Martín, 2002**

Figs. 1A–D, 2A–G, 3A–F

Nooralia bulgannabooyanga San Martín, 2002: 336, figs. 1–3.

Material examined. AUSTRALIA: NEW SOUTH WALES. HOLOTYPE: 1 specimen, AM W26326, Barrenjoey Head, Broken Bay, 33°35'S 151°20'E, algae on rocky substrate, 5 m, J.K. Lowry, R.T., *et al.*, 22 Apr

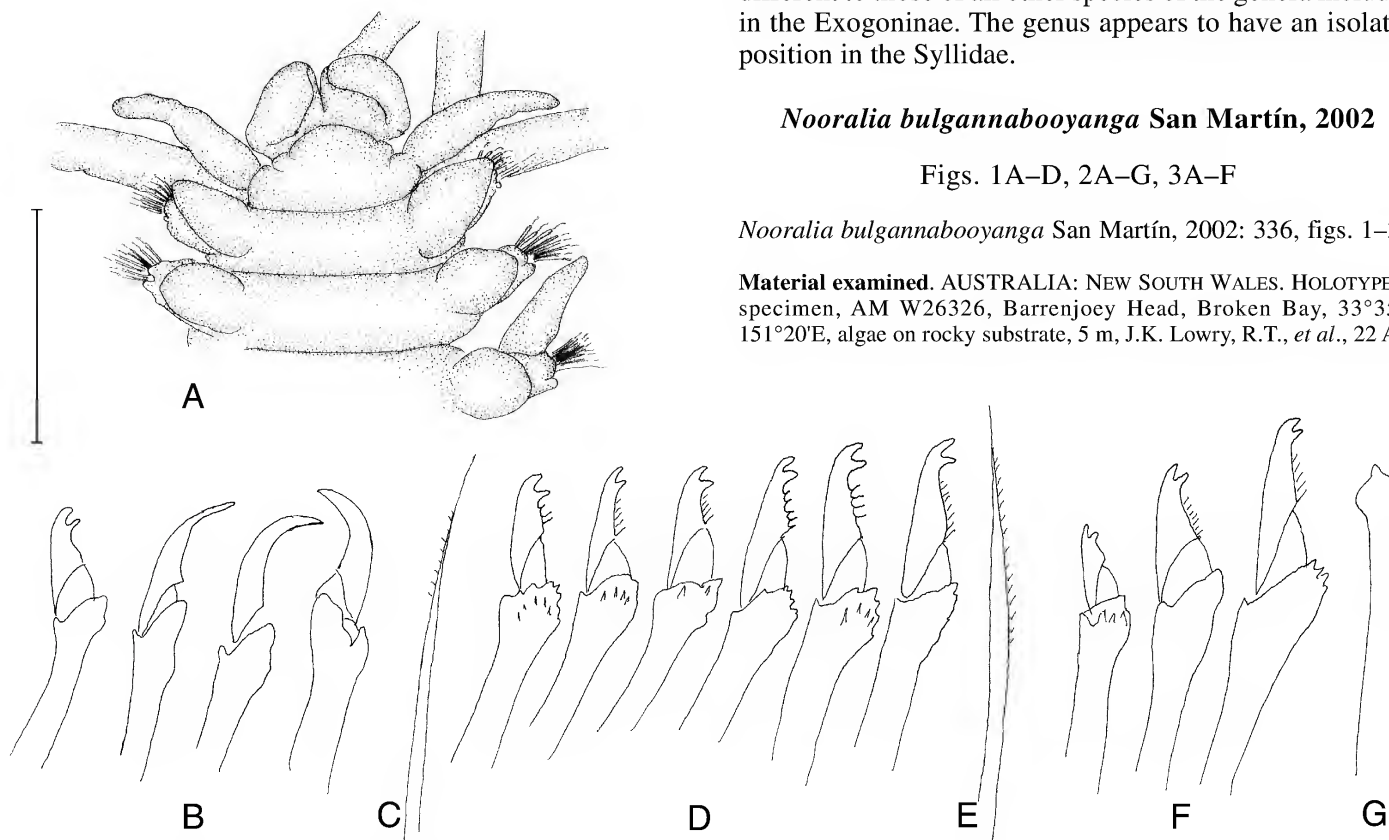


Fig. 2. *Nooralia bulgannabooyanga*. (A) anterior end, ventral view, holotype. (B) compound chaetae, chaetiger 1. (C) dorsal simple chaeta, midbody. (D) compound chaetae, midbody. (E) dorsal simple chaeta, posterior parapodium. (F) compound chaetae, posterior parapodium. (G) acicula. Scale A: 0.09 mm, B–G: 28 µm.

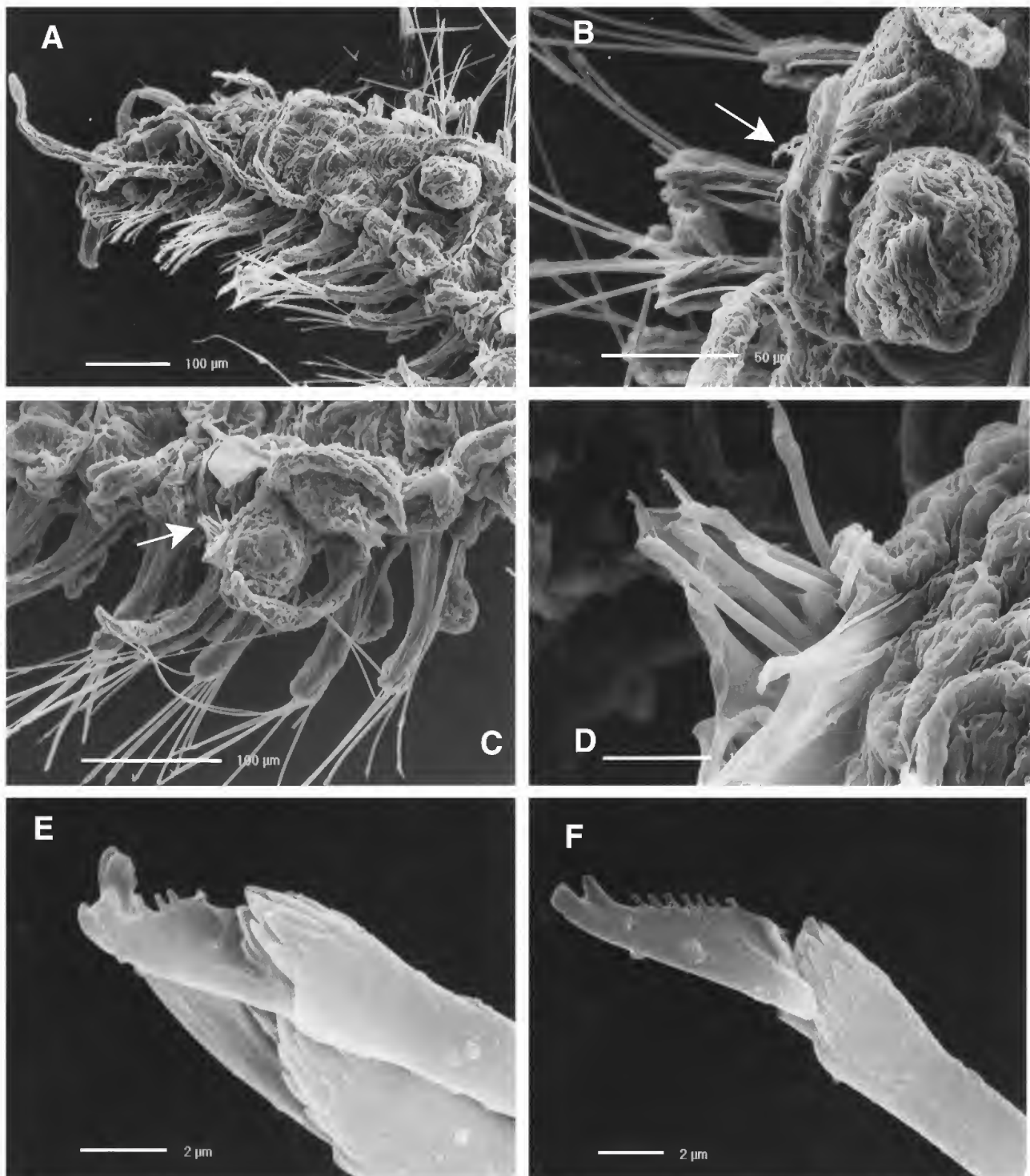


Fig. 3. SEM of *Nooralia bulgannabooyanga*, female carrying dorsally eggs. (A) anterior end, dorsal view. (B) detail of an egg. (C) the same. (D) detail of notochaetae. (E) dorsalmost compound neurochaeta. (F) ventralmost compound neurochaeta (midbody).

1993. Paratype: specimen on SEM stub, AM W27400, Barrenjoey Head, Broken Bay, 33°35'S 151°20'E, algae on rocky substrate, 5 m, J.K. Lowry, R.T., *et al.*, 22 Apr 1993. Paratype: 1 specimen, AM W27399, Barrenjoey Head, Broken Bay, 33°35'S 151°20'E, algae on rocky substrate, 5 m, J.K. Lowry, R.T., *et al.*, 22 Apr 1993. Paratype: 1 specimen, AM W26342, Halfway Reef, 200 m south of Sullivan Reef, Ulladulla, 35°21.42'S 150°29.31'E, airlift over wall of sponges, bryozoa & hydrozoa, 15 m, K. Attwood, *et al.*, 3 May 1997. 1 specimen, AM W28414, Northwest corner of Bowen Island, Jervis Bay, 35°06.8'S 150°46.11'E, dense bryozoans under rock ledge, 13 m, P. Serov & G.D.F. Wilson, 8 Dec 1993. 5 specimens, AM W28405, South ledge, Cook Island, 28°11.65'S 153°34.63'E, rock, 15 m, K. Attwood, 9 Jun 1993. WESTERN AUSTRALIA. 1 specimen. AM W ex 28366, Red Bluff, Kalbarri, 27°42'S 114°9'E, round-leaved seagrass in shallow sand on rocky shore, 3.5 m, R.T. Springthorpe, 10 Jan 1984.

Description. Body small, short, holotype 2.4 mm long, 0.3 mm wide, 31 chaetigers. Prostomium quadrangular to trapezoidal; 4 eyes in trapezoidal arrangement, apparently without anterior eyespots (Fig. 1A,B). Antennae missing on holotype and one paratype; another paratype with lateral antennae but median antenna missing; lateral antennae inserted just in front of anterior eyes, cylindrical, slightly rugose, longer than combined length of prostomium and palps (Fig. 1B); median antenna inserted at same level than lateral antennae, about twice as long. Palps fused at bases (Fig. 1A,B), usually ventrally folded (Fig. 2A). Dorsal tentacular cirri long and thick, laterally directed, similar to

lateral antennae but longer, distinctly longer than body width (Fig. 1A,B); ventral tentacular cirri slightly shorter than half length of dorsal tentacular cirri, oblique to laterally directed (Fig. 1A,B). Dorsal cirri of chaetiger 1 long, anteriorly directed, similar to dorsal tentacular cirri. Dorsal cirri present on all parapodia; dorsal cirri of chaetiger 2 much shorter than those of chaetiger 1, similar in length to ventral tentacular cirri, but distinctly longer than remaining dorsal cirri (Fig. 1A,B); dorsal cirri of midbody lanceolate, shorter than half body width, longer than parapodial lobes, slight variation in length (Fig. 1C). Last 2–3 segments with small dorsal cirri but lacking parapodia and chaetae (Fig. 1D). Ventral cirri large, ovate, slightly laminar (Fig. 2A). Parapodial lobes conical, distally bilobed and provided with posterior papilla (Fig. 2A). Parapodia of chaetiger 1 with 1 compound bidentate chaeta, the dorsalmost one, and 6 compound chaetae with unidentate, smooth, curved blades (Fig. 2B); progressively increasing numbers of compound chaetae with bidentate blades, chaetae with only bidentate blades from chaetiger 3–4. Midbody parapodia each with about 8–9 compound chaetae, strongly heterogomph, with

spinose to rough shafts, and short, bidentate blades with short, fine marginal spines, inverse dorsoventral gradation in length, about 7–8 μm dorsally, 10 μm ventrally (Figs. 2D, 3E,F); posterior parapodia each with 9 compound chaetae, similar to those of midbody, with greater differences between dorsal and ventral blades (Fig. 2F). Dorsal simple chaetae from chaetiger 1, thin, distally with short, fine marginal spines, similar throughout (Fig. 2C,E). Ventral simple chaetae absent. Acicula solitary, slender, distally rounded, with a short, rounded tip (Fig. 2G). Pharynx long, slender, indistinct, everted or partially everted on all specimens, without pharyngeal tooth, a dark glandular area near proventricle (Fig. 1A,B), a crown of 10 soft papillae on anterior rim and few other, small and rounded, near distal crown. Proventricle small, minute, difficult to see, through 1–2 segments (Fig. 1A,B). Pygidium semicircular, with 2 long, wide, anal cirri (bifid on 1 paratype) (Fig. 1D). Females carrying eggs dorsally (Fig. 3A) by means of compound notochoetae (Fig. 3B–D).

Remarks. This genus and species is unique in the family Syllidae, in having the combination of a minute proventricle, unarmed pharynx, palps separated except basally, antennae, tentacular cirri and dorsal cirri of chaetiger 1 long, distally tapered, and remaining dorsal cirri short, spindle-shaped to oval, and, especially, because mature females brooding by means of compound notochoetae. Strictly, this taxon does not belong to any of the known subfamilies of the Syllidae; *Nooralia*, however, is placed provisionally in the Exogoninae because of its small, short body, presence of ventral cirri, short dorsal cirri on midbody, and brooding of eggs.

Distribution. Australia (New South Wales, Western Australia).

Habitat. Amongst algae, bryozoans and hydrozoans; 3.5–15 m depth.

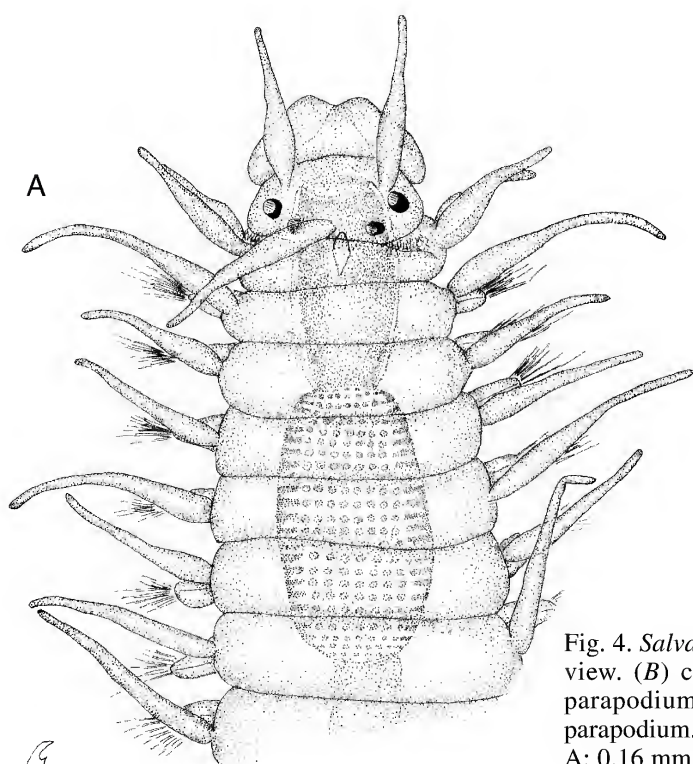
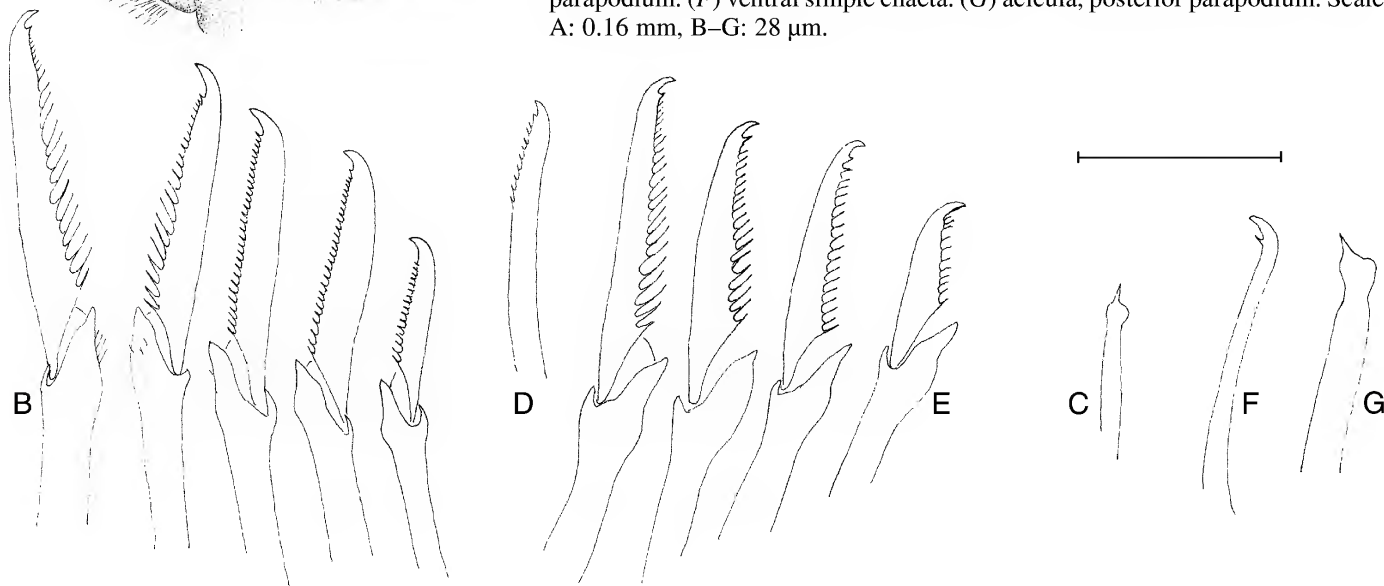


Fig. 4. *Salvatoria kerguelensis* (Australian specimens). (A) anterior end, dorsal view. (B) compound chaetae, anterior parapodium. (C) acicula, anterior parapodium. (D) dorsal simple chaeta. (E) compound chaetae, posterior parapodium. (F) ventral simple chaeta. (G) acicula, posterior parapodium. Scale A: 0.16 mm, B–G: 28 μm .



Genus *Salvatoria* McIntosh, 1885

Salvatoria McIntosh, 1885: 188.

Grubea Quatrefages, 1866: 19.

Grubeosyllis Verrill, 1900: 633.

Protogrubea Czerniavsky, 1881: 414.

Pseudobrania San Martín, 1984: 150.

Brania.—in part Fauvel 1923: 296; in part Kudenov & Harris, 1995: 9. Not Quatrefages 1866.

Type species. *Salvatoria kerguelensis* McIntosh, 1885 by original designation.

Diagnosis. Body small with few segments, around 30, surface smooth, usually without colour markings, but some species with red transverse bands on some segments. Prostomium with 3 antennae, 4 eyes and, usually, 2 eyespots. Palps well developed, joined along their length by dorsal membrane, more or less distinct, sometimes with distal, usually short notch. Two pairs of tentacular cirri. Antennae, tentacular cirri and dorsal cirri usually spindle-shaped, proportionally long and slender in comparison with those present in other genera of the subfamily, usually slightly bulbous at their base and ending with an elongate, acute tip; dorsal cirri present on all segments or absent on chaetiger 2. Parapodia conical, typically ending in 3 rounded, small papillae. Ventral cirri digitiform, shorter than parapodial lobes. Parapodial glands absent. Compound chaetae heterogomph, with blades bidentate, sometimes subdistal tooth small, appearing as unidentate; some parapodia with dorsal and ventral simple capillary chaetae. Acicula usually solitary, acuminate, with long and filiform tip; in some species without tip, appearing distally rounded. Pharynx wide, usually without papillae around the opening, although some larger species have crown of small papillae; usually band of cilia at opening of pharynx; pharyngeal tooth typically rhomboidal to ovate, located anywhere from near anterior margin to about the middle of pharynx. Proventricle proportionally long and wide, massive, sometimes longer than pharynx but usually of the same length, with numerous, slender muscular rows. Pygidium with two anal cirri, similar to dorsal cirri. Reproduction by epigamy, females brooding eggs by means of capillary notochaetae; mature males provided with long natatory notochaetae.

Remarks. The systematic position of this genus has been controversial. McIntosh (1885) included his new genus *Salvatoria* in the family Hesionidae; his diagnosis was confused and incomplete; later, Monro (1939) re-examined the holotype and concluded that it belonged to the family

Syllidae, considering it as a synonym of *Syllides*; this conclusion was followed by Hartman (1964). Previously, Ehlers (1897) described *Sphaerosyllis macintoshi* and considered *Salvatoria kerguelensis* as a synonym of that species; this opinion was accepted by Benham (1921). I have reexamined the holotype of *Salvatoria kerguelensis* and here come to a different conclusion.

First, the supposed articulations described by McIntosh on the antennae and anterior dorsal cirri are an artifact produced by small crystals of formalin; the pharyngeal tooth, although difficult to see, is present, but it is difficult to give its precise position; finally, the chaetae and aciculae are similar to those of other species described in the genus *Grubeosyllis* Verrill, 1900, but not those of *Brania*. Furthermore, McIntosh's original drawing of the holotype (pl. XXX, fig. 4) shows the prostomium in ventral view and the body in dorsal view in a single drawing clearly encouraging misinterpretations of the description.

The original name for this group was *Grubea*; the taxon *Grubeosyllis* was erected by Verrill (1900) specifically as a replacement name for *Grubea*, a name preoccupied by a genus of trematodes (Platyhelminthes). Ignoring Verrill, Fauvel (1923) considered *Brania* as a junior synonym of *Grubea*. Hartman (1959) regarded *Brania*, *Grubeosyllis*, and *Grubea* as synonyms retaining the name *Brania* for the group. Later, San Martín (1984a) erected the genus *Pseudobrania* for this group of species, and designated *Pseudobrania clavata* as the type species. San Martín (1991a) on a further revision, resurrected *Grubeosyllis* and considered *Pseudobrania* San Martín, 1984 as a junior synonym. After examining the holotype of *Salvatoria kerguelensis*, it is apparent that this also belongs to the group, and *Salvatoria* McIntosh, 1885 is proposed as the valid name of this genus, having priority over *Grubeosyllis* Verrill, 1900 (and also over *Pseudobrania* San Martín, 1984). Another possible available name for the genus is *Protogrubea* Czerniavsky, 1881; the generic characters, however, are poorly known and the type material appears lost.

Recently, Kudenov & Harris (1995) did not accept *Brania* and *Grubeosyllis* as different genera; all the species they describe in *Brania* belong to the re-erected genus *Salvatoria*. It appears that they misinterpreted some characters in their discussion. The reasons argued by San Martín (1984a, 1991a) for the separation of *Brania* and *Salvatoria*, are verified because *Salvatoria* broods dorsally by means of capillary notochaetae while *Brania* broods ventrally and develops juveniles attached to the female, which lacks notochaetae.

Key to species of *Salvatoria* recorded from Australia

- | | | |
|---|--|------------------------|
| 1 | Dorsal cirri present on chaetiger 2 | 2 |
| — | Dorsal cirri absent on chaetiger 2 | 6 |
| 2 | Blades of compound chaetae unidentate or provided with small, indistinct subdistal tooth | <i>S. kerguelensis</i> |
| — | Blades of compound chaetae distinctly bidentate | 3 |
| 3 | Blades of compound chaetae slender, elongate. Pharyngeal tooth located near the middle of pharynx | <i>S. longisetosa</i> |
| — | Blades of compound chaetae not elongate; some broad and relatively short. Pharyngeal tooth located near anterior rim | 4 |

- 4 Palps separated on distal $\frac{1}{3}$. Compound chaetae with blades strongly bidentate; space between both teeth wide, distinctly rounded *S. euritmica*
- Palps fused except for distal notch. Teeth of blades not so distinctly separated, forming an angle 5
- 5 Without eyespots. Body proportionally large and broad. Pharyngeal tooth located near anterior rim. Pharynx with papillae. Blades of compound chaetae with short marginal spines *S. quadrioculata*
- With 2 eyespots. Body small and slender. Pharyngeal tooth located distinctly posteriorly to anterior rim. Longer blades with moderately long spines on distal margin *S. koorineclavata* n.sp.
- 6 Pharyngeal tooth located near middle of pharynx. Blades of compound chaetae distinctly bidentate *S. opisthodentata*
- Pharyngeal tooth located near anterior rim. Blades slender, with subdistal tooth small *S. pilkena* n.sp.

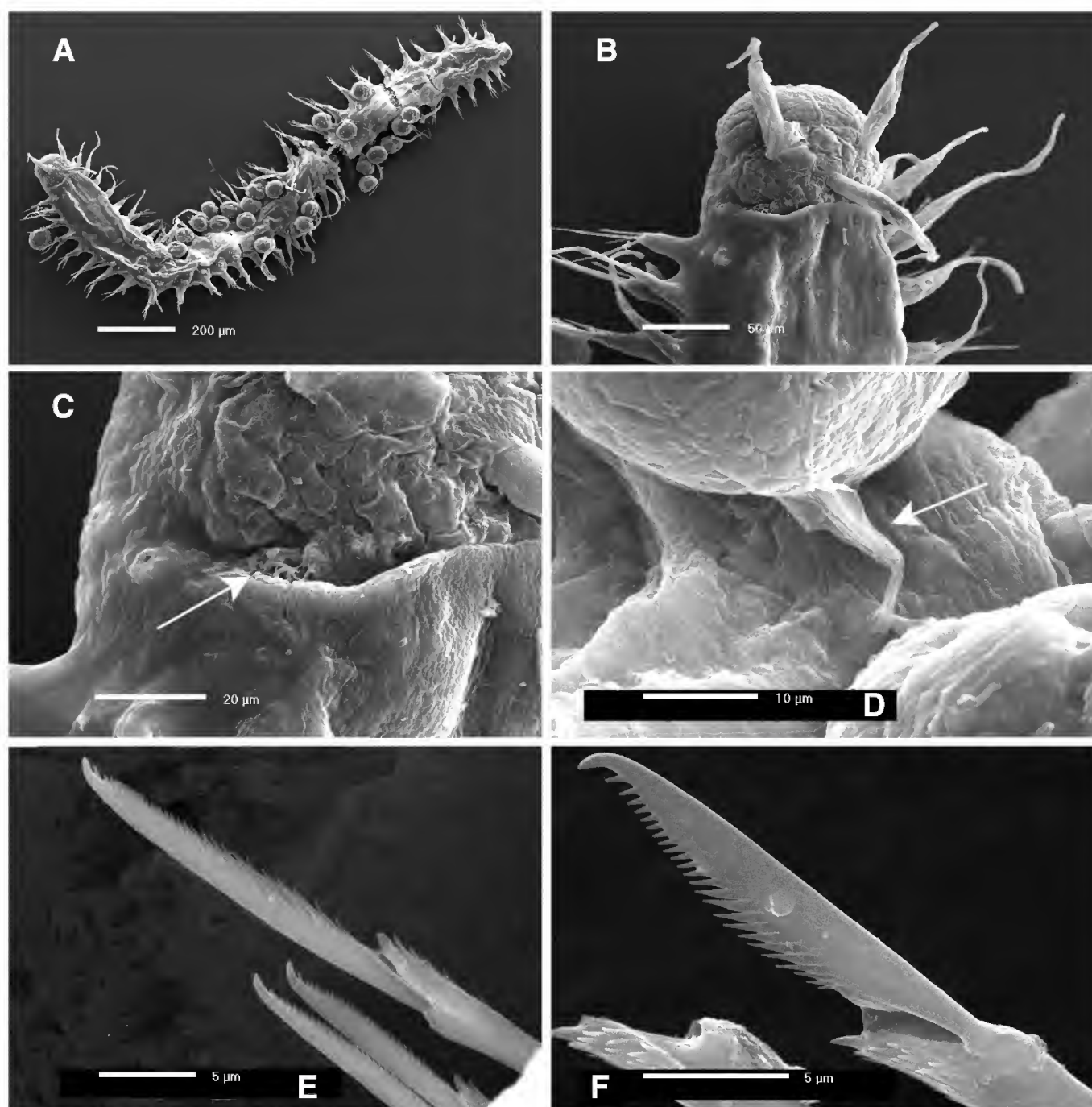


Fig. 5. SEM of *Salvatoria kerguelensis* (Australian specimens). (A) complete female carrying eggs. (B) anterior end, dorsal view. (C) detail of left nuchal organ. (D) capillary notochoetae supporting an egg. (E) dorsal compound chaeta, anterior parapodium. (F) mid compound chaetae, midbody parapodium.

Salvatoria kerguelensis McIntosh, 1885

Fig. 4A–G, 5A–F, 6A–F

Salvatoria kerguelensis McIntosh, 1885: 188, pl. 30, fig. 4, pl. 33, fig. 1, pl. 25a, figs. 11, 12.

Sphaerosyllis macintoshi.—Ehlers, 1897: 46; 1913: 481; Benham, 1921: 26.

Syllides kerguelensis.—Monro, 1939: 114; Hartman, 1964: 91, pl. 28, fig. 8.

Grubea kerguelensis.—Augener, 1913: 252, text-fig. 37, pl. 3, fig. 23. Not Haswell, 1920a: 223, pl. 17, figs. 18–20.

Grubeosyllis kerguelensis.—Augener, 1927: 155.

Material examined. AUSTRALIA: WESTERN AUSTRALIA. 24 specimens, AM W26800, The Blow Holes, Point Quobba, 24°39'S 113°25'E, exposed rock platform, intertidal, brown algae clumps, 0.5 m, J.K. Lowry *et al.*, 7 Jan 1984. 4 specimens, AM W26806, Bush Bay, 30 km south of Carnarvon, 25°10'S 113°39'E, lumps of algae on shallow sandflats, 0.5 m, H.E. Stoddart, 6 Jan 1984. 24 specimens, AM W26809, The Blow Holes, Point Quobba, 24°39'S 113°25'E, short green algae from rock platform edge, 0.5 m, J.K. Lowry *et al.*, 7 Jan 1984. 3 specimens, AM W26810, Bush Bay, 30 km south of Carnarvon, 25°10'S 113°39'E, sand from seagrass beds on shallow sandflats, 0.5 m, H.E. Stoddart, 6 Jan 1984. 6 specimens, AM W27404, Ningaloo reef off Ned's Camp, Cape Range National Park, 21°59.5'S 113°54.5'E, mixed algae, 2 m, J.K. Lowry, 1 Jan 1984. 16 specimens, AM W27411, limestone reef, off Ned's camp, Cape Range National Park, 21°59'S 113°55'E, sponge with epiphytic algae, and muddy worm tubes, 1.5 m, R.T. Springthorpe, 2 Jan 1984. 4 specimens, AM W27414, north end of beach, Bundegi Reef, Exmouth Gulf, 21°49'S 114°11'E, rocky rubble, coralline algae with green epiphyte, 2 m, H.E. Stoddart, 4 Jan 1984. 1 specimen, AM W27417, inshore reef off Ned's Camp, Cape Range National Park, 21°59'S 113°59'E, frilly *Caulerpa* sp., 1 m, J.K. Lowry, 2 Jan 1984.

Description. Body small, complete mature female carrying eggs 2.24 mm long, 0.2 mm wide, for 30 chaetigers. Prostomium ovate to pentagonal, slightly wider than long, with 4 eyes in trapezoidal arrangement and sometimes 2 anterior eyespots; median antenna inserted between posterior pair of eyes, slightly longer than prostomium and palps together, lateral antennae similar to median antenna but shorter (Figs. 4A, 5B), inserted in front of anterior pair of eyes. Palps dorsally joined by a membrane, with a distal notch, slightly ventrally folded, shorter or similar in length to prostomium. A distinct pair of ciliated nuchal organs between prostomium and peristomium (Figs. 4A, 5B,C). Peristomium similar in length to following segments; dorsal tentacular cirri shorter than lateral antennae, ventral tentacular cirri similar to dorsal ones, but shorter. Dorsal cirri on all parapodia; dorsal cirri of chaetiger 1 long, similar in length to chaetiger 1 width, dorsal cirri of chaetiger 2 and 3 distinctly shorter than dorsal cirri of chaetiger 1, those of chaetiger 3 slightly longer than those of chaetiger 2, dorsal cirri of chaetiger 4 similar in length to those of chaetiger 1, remaining dorsal cirri short and long arranged alternately; long cirri slightly shorter than width of corresponding segment (Fig. 4A, 5A,B). Compound chaetae similar throughout; anterior parapodia each with 8–9 compound chaetae, posterior parapodia each with 7; blades indistinctly bidentate, distally hooked, subdistal tooth small on longer blades (Fig. 5E), minute to absent on shorter blades, provided with short marginal spines (Fig. 5F), longer spines on longer blades (Figs. 4B,E, 5E,F), dorsoventral gradation in length of blades, about 11–12 µm above, 6–7 µm below in midbody. Dorsal simple chaetae from midbody, slender, indistinctly bidentate, with small subdistal tooth and short marginal spines (Fig. 4D). Ventral simple chaetae on far posterior chaetigers, sigmoid, indistinctly bidentate, margin

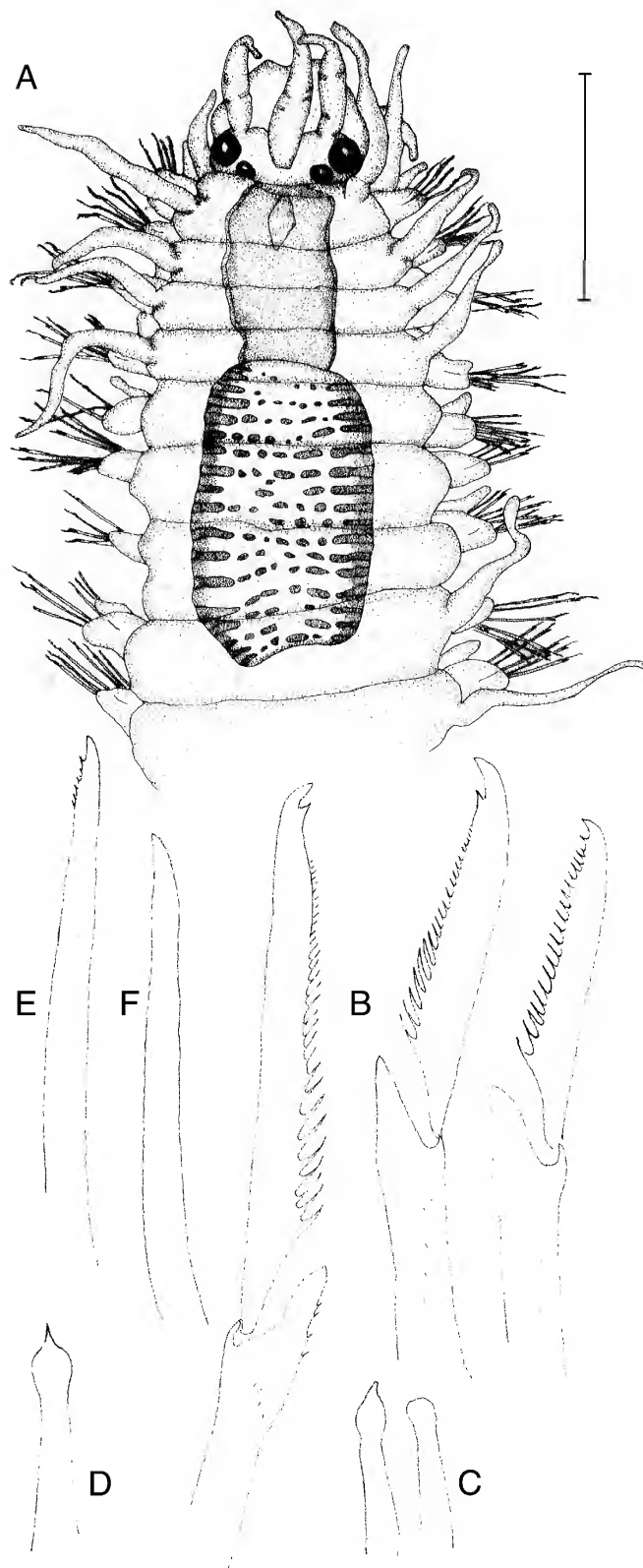


Fig. 6. *Salvatoria kerguelensis*. Holotype (BMNH). (A) anterior end, dorsal view (some dorsal cirri missing). (B) compound chaetae, midbody. (C) aciculae, anterior parapodium. (D) acicula, posterior parapodium. (E) dorsal simple chaeta. (F) ventral simple chaeta. Scale A: 0.26 mm, B–F: 10 µm.

smooth (Fig. 4F). Acicula solitary, slender, acuminate (Fig. 4C), slightly thicker posteriorly (Fig. 4G). Pharynx wide, without papillae, through about 4 segments; pharyngeal tooth rhomboidal, located slightly posteriorly from opening. Proventricle similar in length and width to pharynx (Fig. 4A), through 4 segments, with about 18–20 muscle cell rows. Pygidium small, with 2 anal cirri, similar to dorsal cirri but slightly longer.

Remarks. The holotype of the species is a damaged specimen masked by a dense cover of small crystals, difficult to examine, because it is opaque with some cirri lost (Fig. 6A) and many chaetae broken. It is longer than the above described specimens, about 4.3 mm long, 0.42 mm wide, 33 chaetigers. Compound chaetae similar to the additional material examined (Fig. 6B), but longer (blades 45 μ m above, 10 μ m below in midbody). Two aciculae present in more anterior parapodia, one distally rounded and the other acuminate (Fig. 6C), solitary acuminate acicula in midbody and posterior parapodia (Fig. 6D). Dorsal simple chaetae similar to those of Australian specimens (Fig. 6E), ventral simple chaetae unidentate and smooth (Fig. 6F), only on last chaetiger. Pharyngeal tooth present, apparently near the opening (Fig. 6A), but the exact position is not possible to elucidate because the opacity of the specimen.

The Australian specimens are much smaller than the holotype of the species, and the blades of the compound chaetae are much shorter; so the identification of these Australian specimens as *Salvatoria kerguelensis* is tentative. The compound chaetae are, however, similar and the differences in the location of the pharyngeal tooth could be the result of the poor condition of the holotype.

The record of this species from Port Jackson (Haswell, 1920a) is referred to *Salvatoria longisetosa*.

Distribution. Subantarctic seas: Kerguelen Islands, South Georgia. New Zealand. Australia (Western Australia).

Habitat. Volcanic mud, coralline algae, in sponges, seagrass beds, amongst algae.

***Salvatoria longisetosa* (Hartmann-Schröder, 1979)
n.comb.**

Fig. 7A–D

Brania longisetosa Hartmann-Schröder, 1979: 102, figs. 136, 137; 1980a: 54; 1981: 34; 1982: 67; 1983: 133; 1984: 22; 1985: 70; 1986: 42; 1987: 39; 1989: 27; 1991: 38, figs. 62–64; 1992a: 59. *Grubea kerguelensis*.—Not McIntosh; Haswell, 1920a: 223, pl. 17, figs. 18–20.

Material examined. AUSTRALIA: NEW SOUTH WALES. 1 specimen, AM W487, Port Jackson, 33°51'S 151°16'E. 1 specimen, AM W27203, Lennox Head, 28°48.5'S 153°36.5'E, worm tubes, 1 m, A. Murray *et al.*, 01 Mar 1992. WESTERN AUSTRALIA. 1 specimen, AM W26506, Vancouver Peninsula, near Mistaken Island, King George Sound, 35°4'S 117°56'E, sea grass with hydroids & hydrozoans, 3 m, J.K. Lowry, 13 Dec 1983. 2 specimens, AM W27419, north end of beach, Bundegi Reef, Exmouth Gulf, 21°49'S 114°11'E, rocky rubble, coralline algae with green epiphyte, 2 m, H.E. Stoddart, 4 Jan 1984.

Description. Body small, up to 4.7 mm long, 0.21 mm wide, 33 chaetigers, usually without colour markings, but some mature specimens with transverse rows of red pigment on dorsum of anterior segments. Prostomium ovate; 4 eyes in trapezoidal arrangement, nearly in line, and 2 small anterior eyespots. Median antenna long and slender, spindle-shaped, about 1.5 times as long as combined length of prostomium and palps, inserted between posterior pair of eyes or slightly in front, lateral antennae much shorter, less than half of length of median antenna (Fig. 7A). Palps broad, similar in length to prostomium, dorsally fused all along their length except for a small notch, sometimes ventrally folded. Peristomium similar in length to following segments;

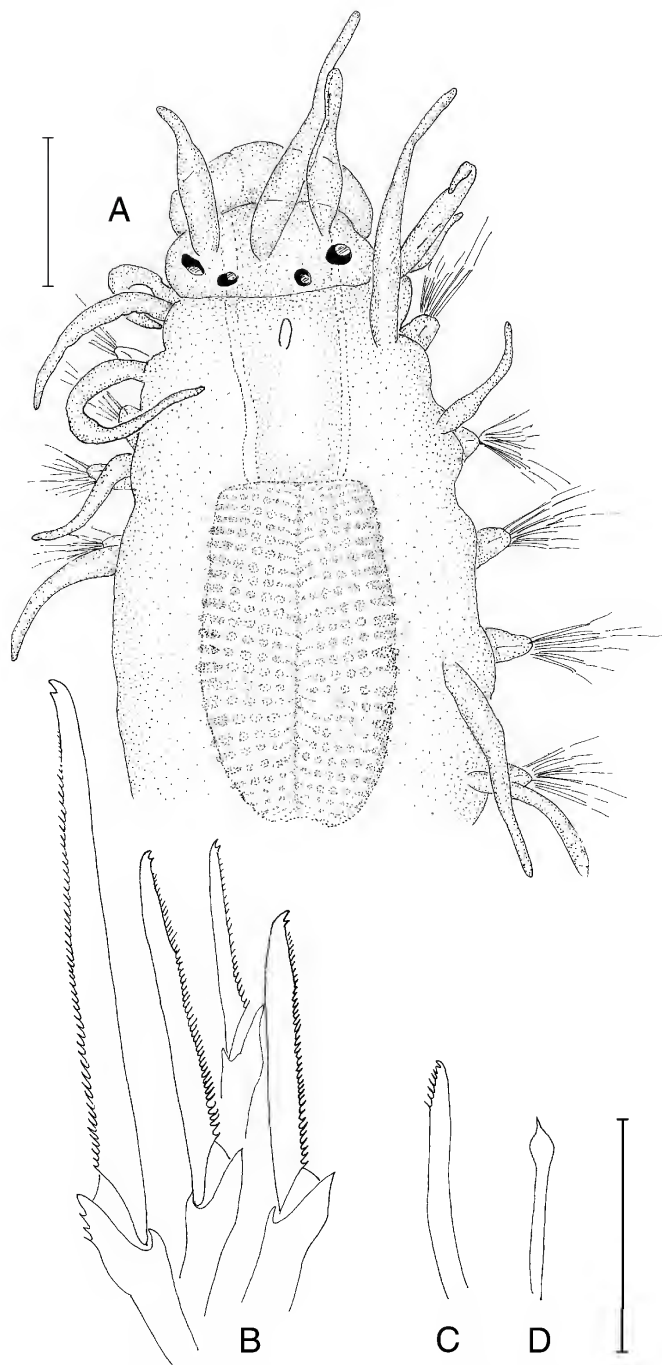


Fig. 7. *Salvatoria longisetosa*. (A) anterior end, dorsal view (some dorsal cirri missing). (B) compound chaetae, midbody. (C) dorsal simple chaeta. (D) acicula. Scale A: 0.1 mm, B–D: 20 μ m.

tentacular cirri similar in shape to antennae, dorsal tentacular cirri similar to median antenna but shorter, ventral tentacular cirri similar in shape and length to lateral antennae. Dorsal cirri on all parapodia, similar to antennae and tentacular cirri in shape (Fig. 7A); dorsal cirri of chaetiger 1 similar in length to median antenna, remaining dorsal cirri varying in length, always shorter than those of chaetiger 1. Compound chaetae with slender shafts and elongate blades, bidentate, with subdistal tooth small and short (Fig. 7B), straight marginal spines; 1–2 dorsalmost chaetae with distinctly long blades, about 50 μ m long, and 6–8 similar chaetae with shorter blades and dorsoventral gradation, 28–29 μ m above, 18 μ m below. Dorsal simple chaetae from midbody, slender, provided with short subdistal spines, minutely bidentate (Fig. 7C). Ventral simple chaetae in far posterior chaetigers, sigmoid, smooth, slender and bidentate. Acicula solitary,

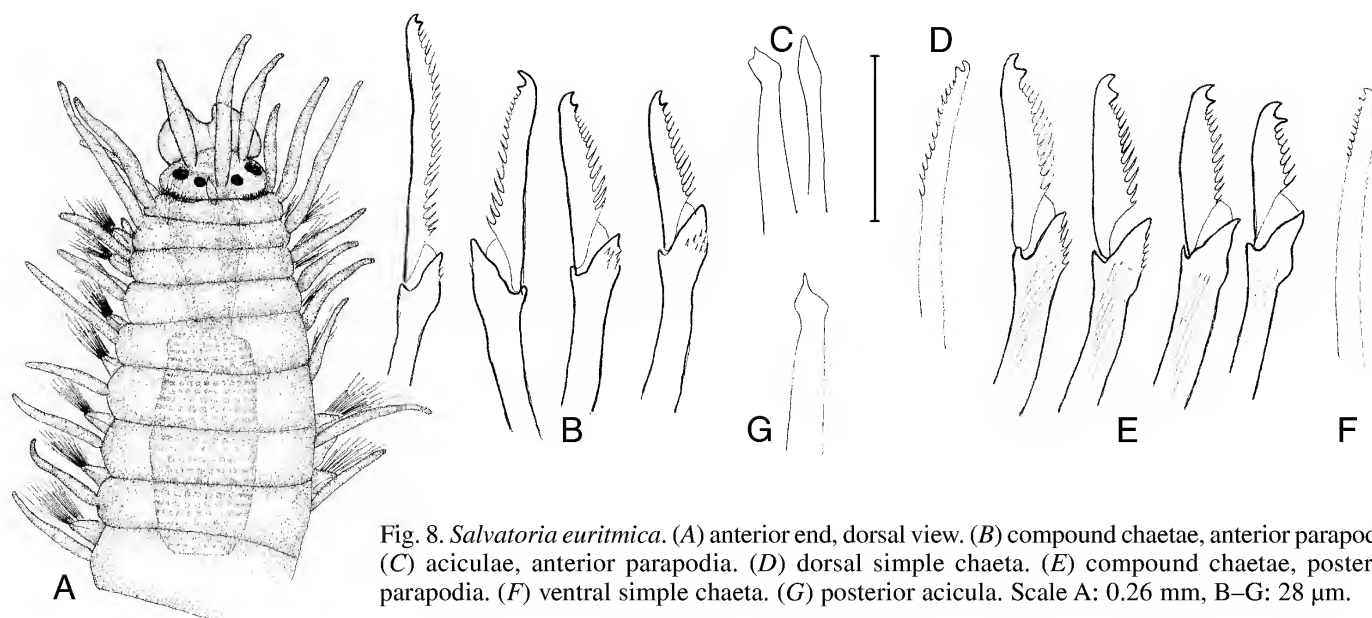


Fig. 8. *Salvatoria euritmica*. (A) anterior end, dorsal view. (B) compound chaetae, anterior parapodia. (C) aciculae, anterior parapodia. (D) dorsal simple chaeta. (E) compound chaetae, posterior parapodia. (F) ventral simple chaeta. (G) posterior acicula. Scale A: 0.26 mm, B–G: 28 μ m.

acuminate (Fig. 7D). Pharynx wide, proportionally long, through about 3–4 segments, without papillae on the opening; pharyngeal tooth small, ovate, located just in front of middle of pharynx (Fig. 7A). Proventricle similar in length and width to pharynx, with about 20–22 muscle cell rows.

Distribution. Australia (reported from all states, except the Northern Territory). Polynesia.

Habitat. Common on all shallow substrates: corals, sand, amongst algae, seagrass.

Salvatoria euritmica (Sardá, 1984)

Fig. 8A–G

Pseudobrania euritmica Sardá, 1984: 10, fig. 1.

Grubeosyllis euritmica.—San Martín, 1991a: 718, figs. 2c,d.

Salvatoria euritmica.—San Martín, 2003: 169, figs. 84–86.

Pionosyllis yambaensis Hartmann-Schröder, 1990: 52, figs. 18–22.

Material examined. AUSTRALIA: WESTERN AUSTRALIA. 1 specimen, AM W26724, Goss Passage, Beacon Island, 28°25.5'S 113°47.0'E, dead plates of *Acropora* covered in coralline algae, 8 m, P.A. Hutchings, 19 May 1994. 1 specimen, AM W26725, Wallabi Group, Houtman Abrolhos, 28°38.68'S 113°45.37'E, bivalves, shell debris, fine sand and algae, 37 m, P.A. Hutchings on FRV "Flinders", 28 May 1994. 1 specimen, AM W27413, Red Bluff, Kalbarri, 27°42'S 114°09'E, mixed brown algae from rocky shore, 4 m, R.T. Springthorpe, 10 Jan 1984. 1 specimen, AM W27418, Red Bluff, Kalbarri, 27°42'S 114°09'E, round-leaved seagrass in shallow sand on rock, 4 m, R.T. Springthorpe, 10 Jan 1984. 7 specimens, AM W27422, Red Bluff, Kalbarri, 27°42'S 114°09'E, mixed coralline algae from rocky shore, 4 m, J.K. Lowry, 10 Jan 1984. Paratype of *Pionosyllis yambaensis*, 1 specimen, ZMUH, P-19966, Yamba, algae, 18 Jan 1976.

Description. Body small, proportionally broad anteriorly; a mature female carrying eggs, 2 mm long, 0.2 mm wide, 28 chaetigers; larger specimens up to 4 mm long, 0.35 mm wide, 29 chaetigers. Prostomium ovate to subpentagonal; 4 large eyes in trapezoidal arrangement and, sometimes, 1 pair of anterior small eyespots. Median antenna spindle-shaped, inserted between posterior eyes, longer than prostomium and palps together, usually about 2 times longer; lateral antennae similar in shape but shorter than median antenna, inserted in front of anterior pair of eyes

(Fig. 8A). Palps similar in length to prostomium, broad, dorsally fused on their basal $\frac{2}{3}$, leaving a deep distal notch. Two distinct ciliated nuchal organs between prostomium and peristomium (Fig. 8A). Peristomium similar in length to following segments; dorsal tentacular cirri similar to median antenna, usually slightly shorter, ventral tentacular cirri similar in length to lateral antennae. Dorsal cirri on all parapodia, spindle-shaped, those of chaetiger 1 longer than remaining, similar in length to median antenna; dorsal cirri of chaetiger 2 and 3 much shorter, remaining dorsal cirri alternating long and short, always shorter than body width (Fig. 8A). Parapodia each with 10 compound chaetae anteriorly, 9 in posterior parapodia, similar throughout, with proportionally thick shafts and strongly bidentate blades, with both teeth similar in size, widely separated by a concave, rounded space, provided with moderately long, fine, erect marginal spines, longer in dorsal chaetae, dorsoventral gradation in length of blades, 22 μ m above 16 μ m below on anterior parapodia (Fig. 8B), 20 μ m above 14 μ m below on posterior parapodia (Fig. 8E). Dorsal simple chaetae distinctly bidentate, with short subdistal marginal spines (Fig. 8D), present from proventricular segments. Ventral simple chaetae similar to dorsal one (Fig. 8F), on most posterior parapodia. Anterior parapodia each with 2 aciculae, one acuminate and another straight, with a subdistal small enlargement (Fig. 8C), remaining parapodia with solitary acicula, acuminate (Fig. 8G). Pharynx wide, usually cup-shaped, through 4–5 segments; pharyngeal tooth ovate, located near opening (Fig. 8A). Proventricle similar in length to pharynx, through about 3–4 segments, with about 15–20 muscle cell rows. Pygidium small, with 2 anal cirri similar to dorsal cirri.

Remarks. The original description of *P. yambaensis* and the examined paratype of that species agrees with the descriptions of *Salvatoria euritmica* from the Mediterranean Sea, so I assume that they are synonyms.

Distribution. Southern area of Spanish Mediterranean, Caribbean Sea, Australia (Western Australia, New South Wales).

Habitat. Amongst algae, seagrass, debris, in shallow water.

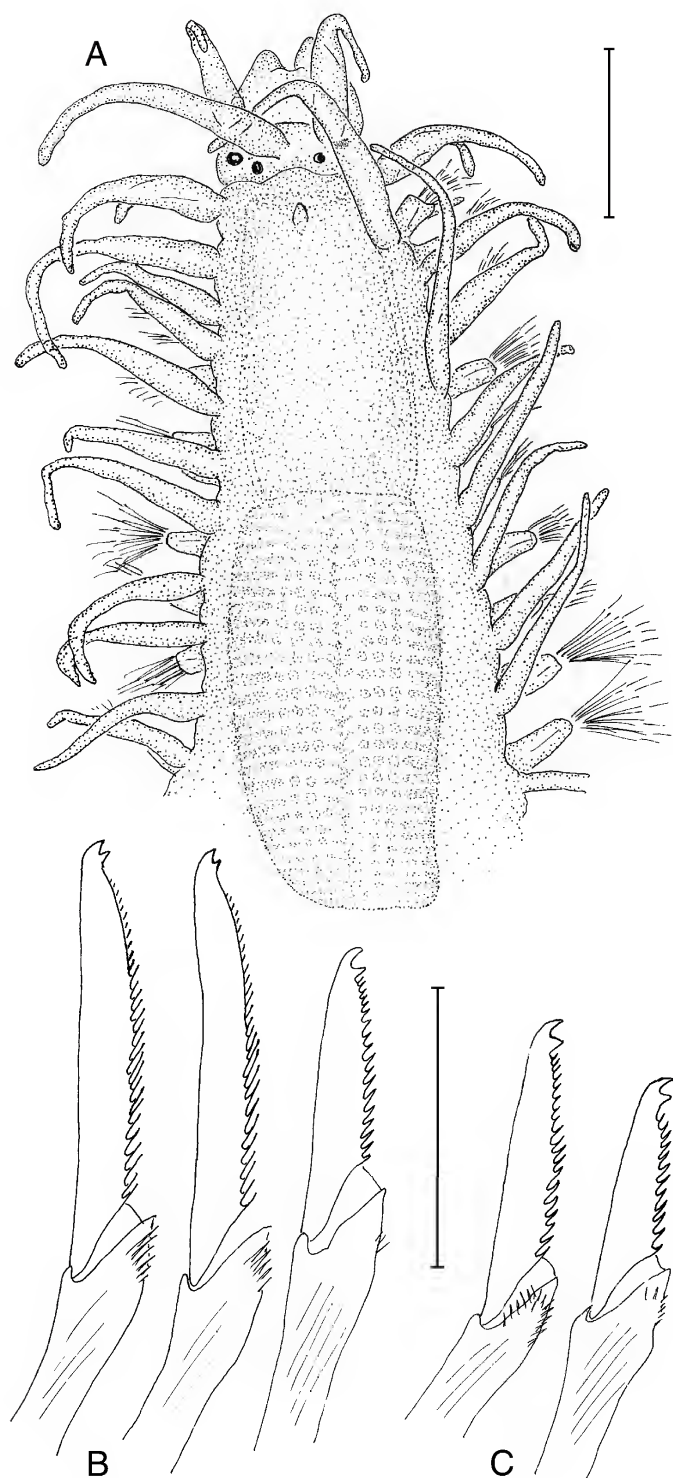


Fig. 9. *Salvatoria quadrioculata*. (A) anterior end, dorsal view. (B) compound chaetae, anterior parapodium. (C) compound chaetae, posterior parapodium. Scale A: 0.2 mm, B,C: 20 μ m.

***Salvatoria quadrioculata* (Augener, 1913) n.comb.**

Figs. 9A–C, 10A–D

Grubea quadrioculata Augener, 1913: 254, pl. 3, fig. 31, text-fig. 38; Haswell, 1920a: 223, pl. 17, figs. 21–26.

Material examined. AUSTRALIA: NEW SOUTH WALES. 1 specimen, AM W488, Port Jackson, 33°51'S 151°16'E. 1 specimen on slide, AM W25239, Port Jackson, 33°50'S 151°16'E. 1 specimen, AM W26421, Manta Reef, North West Solitary Island, 30°01.5'S 153°16.5'E, curly bryozoan, 18 m, R.T. Springthorpe, 25 Jun 1992. 17 specimens, AM W26438, 150 m east of Burrill Rocks, 35°23.41'S 150°28.18'E, dead bryozoan encrusted with algae, bryozoa and hydroids, 17 m, K. Attwood, 1 Mar 1997. 8 specimens, AM W26439, Manta Reef, North West Solitary

Island, 30°01.5'S 153°16.5'E, lace bryozoan, 19 m, R.T. Springthorpe, 25 Jun 1992. 1 specimen, AM W26536, northern side of Bannister Head, 35°19.15'S 150°29.12'E, grey sponge from top of boulder, 18 m, K. Attwood, 6 May 1997. 1 specimen, AM W26538, 100 m north west of Split Solitary Island, 30°14.0'S 153°10.8'E, encrusting algae & ascidians, 16 m, E.L. Albertson, 7 Mar 1992. 1 specimen, AM W26539, Halfway Reef, 200 m south of Sullivan Reef, Ulladulla, 35°21.42'S 150°29.31'E, airlift over wall of sponges, bryozoa & hydrozoa, 15 m, K. Attwood *et al.*, 3 May 1997. 5 specimens, AM W26540, 150 m east of Burrill Rocks, 35°23.41'S 150°28.18'E, surface of sponges, 19 m, K. Attwood *et al.*, 1 May 1997. 1 specimen, AM W26545, Burrill Rocks, Ulladulla, 35°23.29'S 150°28.24'E, gorgonacean, 24 m, R.T. Springthorpe, 7 May 1997. 2 specimens, AM W26659, north east corner of Clark Island, 33°51.85'S 151°14.47'E, *Ecklonia* holdfast, 5 m, P.A. Hutchings, 17 Apr 1996. 1 specimen, AM W26507, west side of Bowen Island, half way along, ACT, 35°06.91'S 150°45.91'E, pink sponge on overhang and surrounding bottom, 8 m, P. Serov & G.D. F. Wilson, 7 Dec 1993. 15 specimens (4 on SEM stub), AM W26508, half way along west side of Bowen Island, Jervis Bay, ACT, 35°06.91'S 150°45.91'E, sponge encrusted rock, smooth grey sponge, 6 m, P. Serov & G.D.F. Wilson, 7 Dec 1993. 1 specimen, AM W26509, west side of Bowen Island, half way along, ACT, 35°06.91'S 150°45.91'E, grey sponge with orange flesh, large oscular chamber, 8 m, P. Serov & G.D.F. Wilson on "Sula", 7 Dec 1993.

Description. Body long, proportionally broad, 3.5–4 mm long, 0.3 mm wide, 33 chaetigers; segments wide and short (Figs. 9A, 10A,B). Prostomium ovate, wider than long, with 4 eyes in trapezoidal arrangement nearly in line. Median antenna long, thick at bases, more than twice as long as prostomium and palps together, inserted just in front of line between posterior eyes; lateral antennae similar in thickness but much shorter, similar in length to prostomium and palps together. Palps broad, slightly longer than prostomium, fused dorsally except for a distinct anterior notch (Figs. 9A, 10B). Peristomium covering posterior margin of prostomium; dorsal tentacular cirri similar to antennae, longer than lateral antennae but shorter than median antenna, ventral tentacular cirri similar in length to lateral antennae. Dorsal cirri on all parapodia (Fig. 9A); dorsal cirri of chaetiger 1 long, similar in length to median antenna, longer than body width, dorsal cirri of chaetigers 2 and 3 much shorter, remaining dorsal cirri irregularly varying in length. Compound chaetae with proportionally thick shafts, ornamented with short subdistal spines, and long, wide, strongly bidentate blades, with short, erect marginal spines (Fig. 10D); anterior parapodia each with about 10–11 compound chaetae, dorsoventral gradation in lengths of blades, 32 μ m above, 22 μ m below, teeth thicker and more separated ventrally (Fig. 9B); progressively posteriorly number of compound chaetae declines, with 4–5 on each posterior parapodia, with less marked dorsoventral gradation in length of blades, 23 μ m above, 18 μ m below, all compound chaetae similar to ventral ones of anterior parapodia (Fig. 9C). Dorsal and ventral simple chaetae not seen. Acicula solitary, acuminate. Pharynx wide, extending through about 6 segments, surrounded by a crown of few, small, soft papillae on the opening (Fig. 10C); pharyngeal tooth apparently small (but long when pharynx is everted, Fig. 10C), located close to anterior rim. Proventricle similar in shape to pharynx, through about 6 segments, with about 18–20 muscle cell rows. Pygidium small, provided with 2 long anal cirri, similar in shape to dorsal cirri.

Distribution. Australia: (Western Australia, New South Wales).

Habitat. Sublittoral, on sponges, bryozoans, ascidians, hydrozoans, gorgoneans, amongst crusts of calcareous algae, kelp holdfasts, in depths to 24 m.

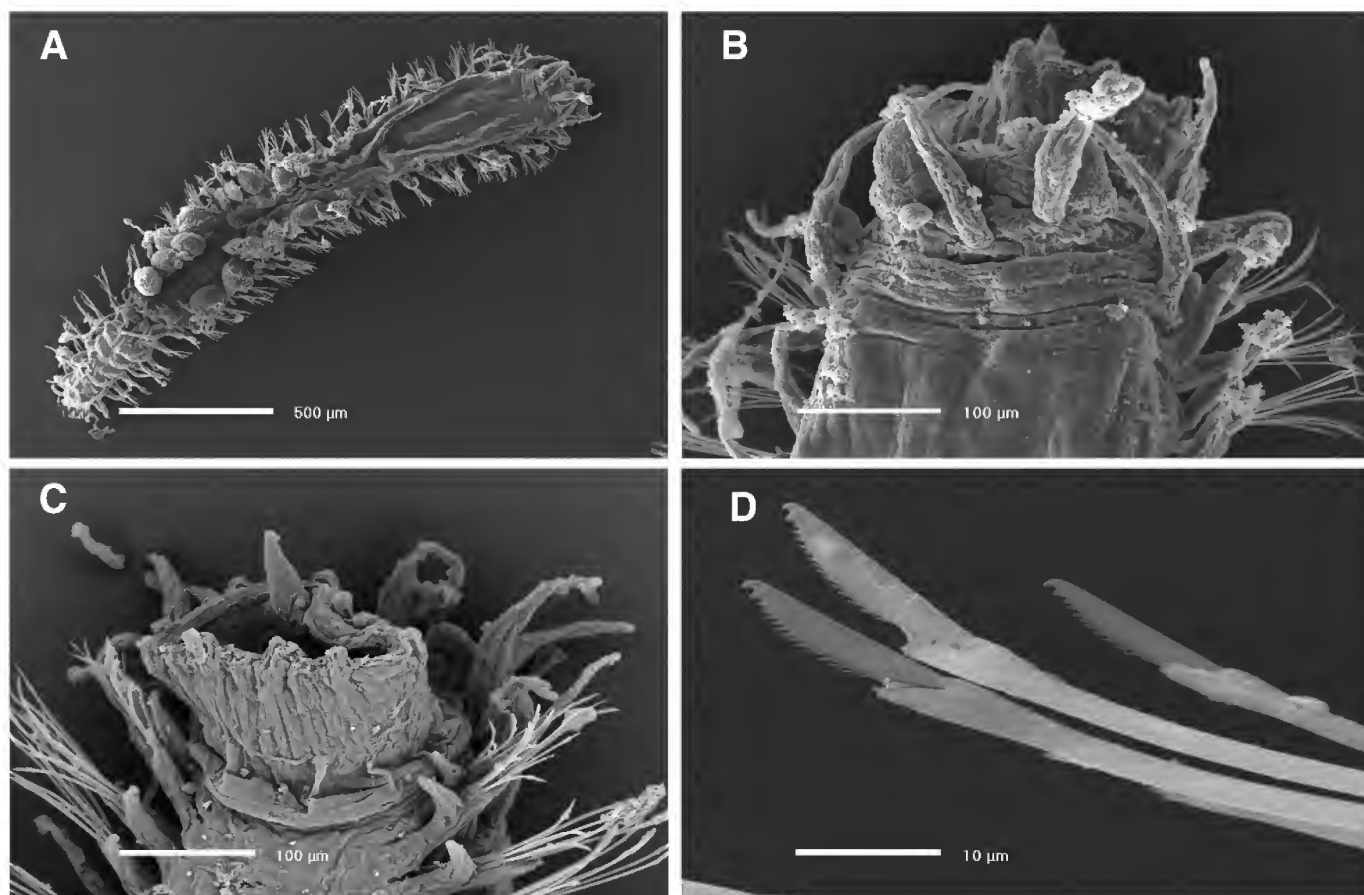


Fig. 10. SEM of *Salvatoria quadrioculata*. (A) complete female, carrying eggs. (B) anterior end, dorsal view. (C) everted proboscis, ventral view. (D) compound chaetae, midbody.

***Salvatoria koorineclavata* n.sp.**

Figs. 11A–G, 12A–E

Brania clavata.—Hartmann-Schröder, 1979: 100, figs. 129–133; 1980: 53; 1990: 53; 1991: 37. Not Claparède, 1863.

Material examined. AUSTRALIA: NEW SOUTH WALES. HOLOTYPE, AM W26445, 400 yards south of southern entrance to Jervis Bay, ACT, 35°7'S 150°46'E, 21.3 m, P.A. Hutchings, 22 July 1972. PARATYPE: 1 specimen, AM W26446, southwest Bowen Island, ACT, 35°07.49'S 150°45.77'E, small pink/white sponge with irregular lobes found in seagrass, 8 m, P. Serov & G.D. F. Wilson, 8 Dec 1993. PARATYPE: 1 specimen, AM W15811, south bank of Lake Merimbula, 36°53.7'S 149°54.5'E, on short *Zostera* & *Halophila* spp., J.H. Day *et al.*, 6 Oct 1975. 7 specimens, AM W26423, southwest side of South Solitary Island, 30°12.0'S 153°16.0'E, coral rubble, 18 m, R.T. Springthorpe, 24 Jun 1992. 1 specimen, AM W26424, Richmond River, near shore Ballina, old wharf between Cherry & Martin Sts, 28°52.5'S 153°33.6'E, drift algae, 6 m, S.J. Keable, 5 Mar 1992. 4 specimens, AM W26425, 100 m north west of Split Solitary Island, 30°14.0'S 153°10.8'E, mixed red algae, 15 m, S.J. Keable, 7 Mar 1992. 4 AM W26426, 100 m northwest of Split Solitary Island, 30°14.0'S 153°10.8'E, mixed red algae, 15 m, S.J. Keable, 7 Mar 2000. 1 specimen, AM W26427, 150 m east of Burrill Rocks, 35°23.41'S 150°28.18'E, dead bryozoan encrusted with algae, bryozoa and hydroids, 17 m, K. Attwood, 1 May 1997. 1 specimen, AM W26510, southwest Bowen Island, ACT, 30°07.49'S 150°45.77'E, sandy bottom; rock with bryozoans & encrusting polychaetes, 8 m, P. Serov & G.D.F. Wilson, 8 Dec 1993. 1 specimen, AM W26642, Bottle and Glass Rocks, Port Jackson, 33°50.9'S 151°16.2'E, airlift, 12 m, G. Clark, 11 Dec 1989. 3 specimens, AM W26649, Grotto Point, Port Jackson, 33°49'S 151°15'E, algae, 4 m, P. Colman, 18 July 2000. 1 specimen, AM W26660, Grotto Point, Port Jackson, 33°49'S 151°15'E, algae, 4 m, P. Colman, 22 Apr 1983. 6 specimens, AM W27408, 100 m north west of Split Solitary Island, 30°14.0'S 153°10.8'E, mixed red algae, 15 m, S.J. Keable, 7 Mar 1992. SOUTH AUSTRALIA. 1 specimen, AM W26742, Elliston Reef, 33°39'S 134°53'E, algae from reef flat at low tide, P.A. Hutchings, 11 Mar 1979. WESTERN AUSTRALIA. PARATYPE: 1 specimen, AM W26514, off end of South Mole, Arthur Head, Fremantle, 32°3'S 115°44'E, orange tunicates,

6 m, J.K. Lowry, 25 Dec 1983. 1 specimen, AM W26691, Goss Passage, Beacon Island, 28°25.5'S 113°47.0'E, dead plates of *Acropora* covered in coralline algae, 8 m, P.A. Hutchings, 19 May 1994. 3 specimens, AM W26692, north end of Long Island, Goss Passage, 28°27.9'S 113°46.3'E, dead coral covered in coralline algae & brown algae, 6 m, C. Bryce, 22 May 1994. 1 specimen, AM W26693, jetty adjacent to Fisheries Hut, Beacon Island, 28°25.5'S 113°47.0'E, dead coral with plate-like *Montipora* & *Acropora* spp., 12 m, P.A. Hutchings, 23 May 1994. 1 specimen, AM W26694, north end of Long Island, Goss Passage, 28°28.3'S 113°46.3'E, dead coral covered with coralline algae & boring bivalves, 8 m, C. Bryce, 22 May 1994. 1 specimen, AM W26695, south west corner of Lucas Island, Kimberleys, 15°13'S 124°31'E, 30 m, P.A. Hutchings, 24 July 1988. 1 specimen, AM W26696, east side of West Wallabi Island, 28°27.9'S 113°40.9'E, in *Posidonia australis* root mat, plus epifauna, 2 m, P.A. Hutchings, 26 May 1994. 4 specimens, AM W26697, off south end of Long Island, Beacon Island, 28°28.8'S 113°46.3'E, dead coral covered in coralline algae, 5 m, P.A. Hutchings, 25 May 1994. 1 specimen, AM W26698, Goss Passage, Beacon Island, 28°25.5'S 113°47.0'E, dead branching coral covered in coralline algae, 10 m, P.A. Hutchings, 18 May 1994. 156 specimens, AM W26830, inshore reef off Ned's Camp, Cape Range National Park, 21°59'S 113°55'E, green algae, 1.5 m, R.T. Springthorpe, 2 Jan 1984. 1 specimen, AM W26835, reef west of groyne, 2 km south of Cape Peron, 32°16'S 115°41'E, *Ulva* sp. on new limestone boulder groyne, 1 m, H.E. Stoddart, 26 Dec 1983. 33 specimens, AM W27401, limestone reef, off Ned's camp, Cape Range National Park, 21°59'S 113°55'E, sponge with epiphytic algae, and muddy worm tubes, 1.5 m, R.T. Springthorpe, 2 Jan 1984. 10 specimens, AM W27402, inshore reef, Ned's Camp, Cape Range National Park, 21°59'S 113°55'E, very fine sediment and sand from patches in reef, 1 m, H.E. Stoddart, 2 Jan 1984. 19 specimens, AM W27403, north end of beach, Bundegi Reef, Exmouth Gulf, 21°49'S 114°11'E, rocky rubble, coralline algae with green epiphyte, 2 m, H.E. Stoddart, 4 Jan 1984. 3 specimens, AM W27405, Red Bluff, Kalbarri, 27°42'S 114°09'E, mixed brown algae from rocky shore, 4 m, R.T. Springthorpe, 10 Jan 1984. 5 specimens, AM W27406, Bush Bay, 30 km south of Carnarvon, 25°10'S 113°39'E, lumps of algae on shallow sandflats, 0.5 m, H.E. Stoddart, 6 Jan 1984. 7 specimens, AM W27407, Bush Bay, 30 km south of Carnarvon, 25°10'S 113°39'E, tufted balls of algae on shallow sandflats, 0.5 m, H.E. Stoddart, 6 Jan 1984. 4 specimens,

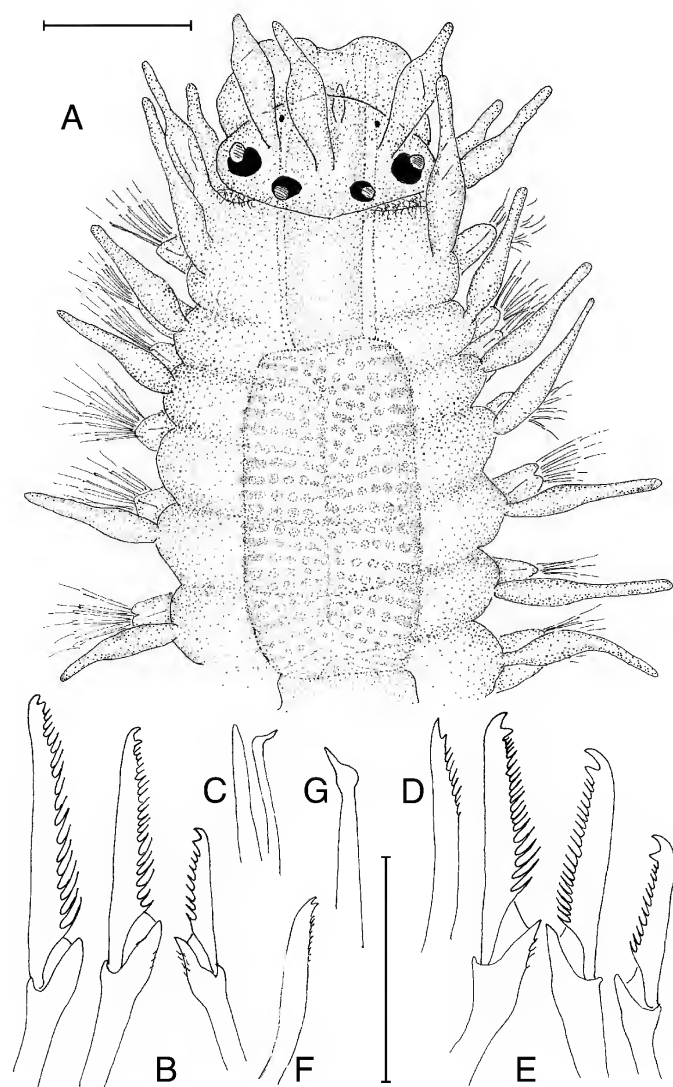


Fig. 11. *Salvatoria koorineclavata* n.sp. (A) anterior end, dorsal view of holotype. (B) compound chaetae, anterior parapodia. (C) aciculae, anterior parapodia. (D) dorsal simple chaeta. (E) compound chaetae, posterior parapodia. (F) ventral simple chaeta. (G) acicula, posterior parapodium. Scale A: 0.1 mm, B–G: 20 μ m.

AM W27409, Bush Bay, 30 km south of Carnarvon, 25°10'S 113°39'E, sand from seagrass beds on shallow sandflats, 0.5 m, H.E. Stoddart, 6 Jan 1984. 23 specimens, AM W27416, inshore reef off Ned's Camp, Cape Range National Park, 21°59'S 113°59'E, frilly *Caulerpa* sp., 1 m, J.K. Lowry, 2 Jan 1984. 1 specimen, AM W27423, 5 km offshore, Bush Bay, 30 km south of Carnarvon, 25°10'S 113°39'E, airlift in strap-leaved seagrass beds, 2 m, J.K. Lowry & R.T. Springthorpe, 6 Jan 1984. 58 specimens, AM W27424, north end of beach, Bundegi Reef, Exmouth Gulf, 21°49'S 114°11'E, rocky rubble, brown algae with epiphytes, sediment, 2 m, H.E. Stoddart, 4 Jan 1984. 1 specimen, AM W27425, Red Bluff, Kalbarri, 27°42'S 114°09'E, rocky shore, dictyotalean from cave, 4 m, J.K. Lowry, 10 Jan 1984.

Description. Body small, holotype is a mature male with natatory chaetae, 2 mm long, 0.27 mm wide, for about 27 chaetigers. Prostomium ovate, wider than long, with 4 thick eyes in trapezoidal arrangement and 2 anterior eyespots. Antennae spindle-shaped (fig. 12A), subdistally inflated, ending in short tip, similar in length to combined lengths of prostomium and palps or slightly longer, median antenna longer than lateral antennae, inserted slightly in front of line between posterior eyes (Fig. 11A), lateral antennae inserted in front of and medial to anterior eyes (Fig. 11A). Palps similar in length to prostomium or shorter, fused dorsally by a membrane, with a small distal notch,

sometimes ventrally folded (Fig. 12B). Two distinct ciliated nuchal organs between prostomium and peristomium (Figs. 11A, 12A). Peristomium similar in length to following segments; tentacular cirri similar to antennae but more elongate, dorsal pair similar in length to lateral antennae, ventral pair shorter. Dorsal cirri spindle-shaped, present on all chaetigers, all similar in length or with slight variations in length, except those of chaetiger 1, which are slightly longer than subsequent ones (Fig. 11A). Compound chaetae with bidentate blades, both teeth similar, provided with moderately long, distally directed, thin spines basally, shorter and straight as more distal on margin (Fig. 12E); spines longer in dorsalmost chaetae. Anterior parapodia each with about 9–10 compound chaetae (Fig. 11B), with dorsoventral gradation in length, 26 μ m above, 12–13 μ m below; posteriorly number of compound chaetae declines progressively to 5–6 on posterior parapodia, provided with shorter blades, less marked dorsoventral gradation in length of blades (Fig. 11E), 22 μ m above, 16 μ m below, and more strongly bidentate. Dorsal simple chaetae from anterior chaetigers, sometimes from chaetiger 1, bidentate, subdistal tooth shorter than distal tooth, with short subdistal marginal spines (Fig. 11D). Ventral simple chaetae on most posterior parapodia of some specimens, sigmoid, bidentate, similar to dorsal ones (Fig. 11F). Anterior parapodia each with 2 aciculae, one straight and another one acuminate (Fig. 11C); solitary acicula in midbody and posterior parapodia, acuminate, with long tip (Fig. 11G). Pharynx relatively long, through about 4–5 segments; pharyngeal tooth small, rhomboidal to ovate, located near anterior margin, but distinctly posteriorly, without papillae on opening. Proventricle similar in length to pharynx, through about 5 segments, with 21–22 muscle cell rows. Pygidium small, with 2 anal cirri, similar to dorsal cirri but slightly longer.

Remarks. This species has been previously reported from Australia as *Brania clavata* (= *Salvatoria clavata*); both species are similar and are easy to confuse; the Australian species, however, has a relatively longer pharynx and proventricle than the European species; in addition blades of compound chaetae are provided with relatively longer and upwards curved marginal spines, straight in *S. clavata*, and the pharyngeal tooth is located much more anteriorly than in *S. clavata* (San Martín, 2003). I have examined two specimens reported from Australia as *Brania clavata* by Hartmann-Schröder (HZM P-16668) and it is clear that they are not that species, but *S. koorineclavata* n.sp. So, the species *S. clavata* is probably not present in Australia and the records are referred to *S. koorineclavata*.

Other species described from other parts of the world, usually under the genus name *Brania*, are similar, both to *S. clavata* and *S. koorineclavata* n.sp., but details of the pharynx and proventricle as well as details of the compound chaetae are different. *Salvatoria californiensis* (Kudenov & Harris, 1995) has similar chaetae, but with shorter spines on the margin and less developed teeth, the acicula lacks a well defined acute tip, and the proventricle is much shorter, running through 2 segments instead of about 5 segments in *S. koorineclavata*, with fewer rows of muscle cells (19 rather than 21–22). *Salvatoria clavata* has been reported worldwide, but probably represents a suite of species.

Distribution. Australia (all States).

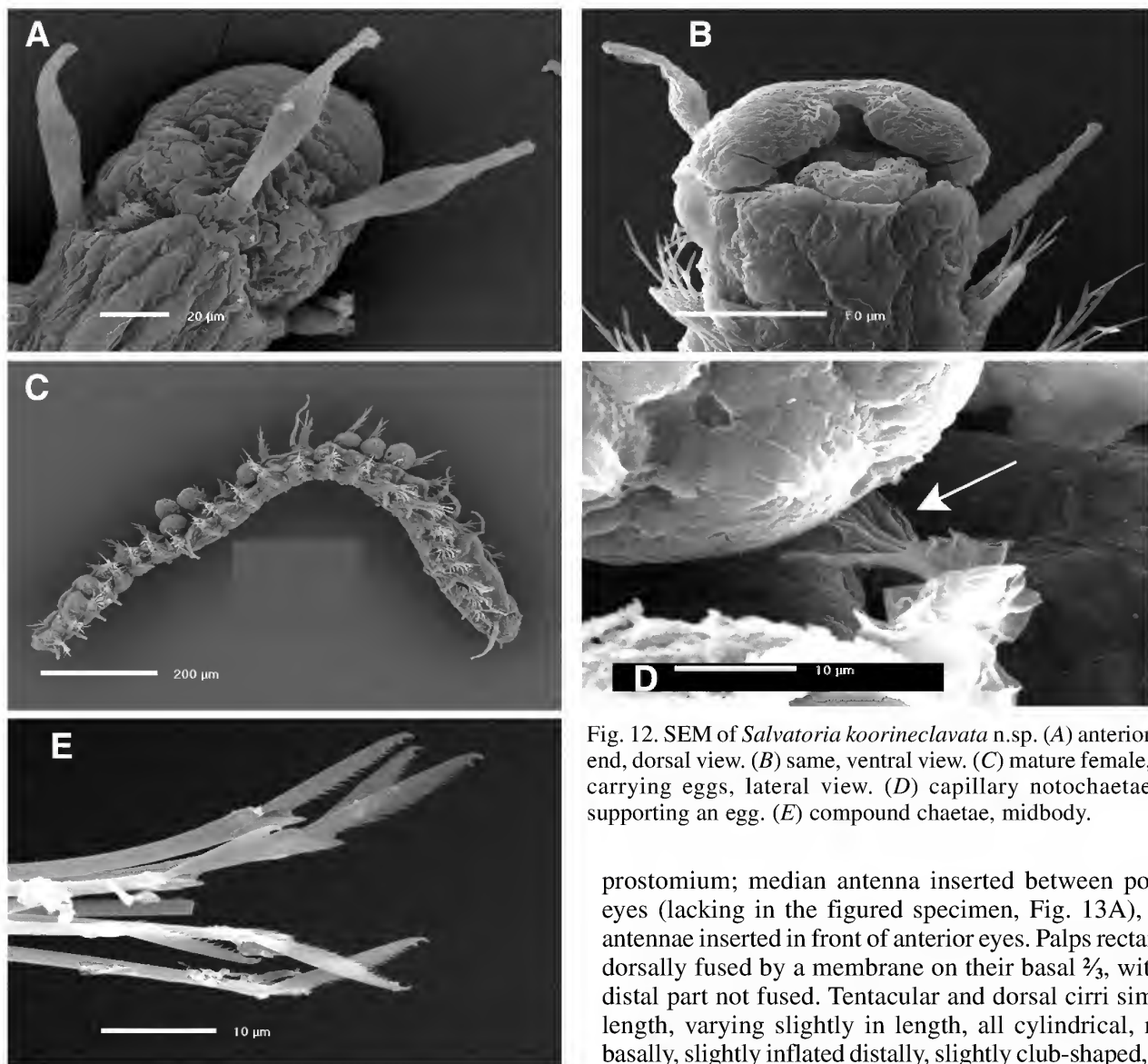


Fig. 12. SEM of *Salvatoria koorineclavata* n.sp. (A) anterior end, dorsal view. (B) same, ventral view. (C) mature female, carrying eggs, lateral view. (D) capillary notochaetae supporting an egg. (E) compound chaetae, midbody.

Habitat. Common in shallow waters on a variety of substrates, to 29 m depth.

Etymology. The name comes from an Aboriginal word, *Koorine*, meaning “daughter”, in relation with the similarity of the Australian species to the European species of *S. clavata*.

Salvatoria opisthodentata
(Hartmann-Schröder, 1979) n.comb.

Fig. 13A–D

Brania opisthodentata Hartmann-Schröder, 1979: 101, figs. 134, 135; 1981: 35. Not Hartmann-Schröder, 1991: 38, figs. 65–67.

Material examined. AUSTRALIA: NEW SOUTH WALES. 1 specimen, AM W26543, 100 m north west of Split Solitary Island, 30°14.0'S 153°10.8'E, encrusting algae & ascidians, 16 m, E.L. Albertson, 7 Mar 1992. VICTORIA. 2 specimens, MV F62748, eastern Bass Strait, 11.7 km west of Pt. Ricardo, 37°49.9'S 148°01'E, sand & shell, 29 m depth, 28 Sept 1990.

Description. Body fragile, delicate, broken specimens often lacking some appendages, minute, 1.9 mm long, 0.12–0.2 mm wide, 26 chaetigers. Prostomium ovate, wider than long, with 4 large eyes in trapezoidal arrangement and, sometimes, 2 anterior eyespots. Antennae slightly spindle-shaped, not longer than combined lengths of palps and

prostomium; median antenna inserted between posterior eyes (lacking in the figured specimen, Fig. 13A), lateral antennae inserted in front of anterior eyes. Palps rectangular, dorsally fused by a membrane on their basal $\frac{2}{3}$, with long distal part not fused. Tentacular and dorsal cirri similar in length, varying slightly in length, all cylindrical, narrow basally, slightly inflated distally, slightly club-shaped, absent on chaetiger 2 (Fig. 13A). About 4–5 compound chaetae on each parapodium, blades short, 18 µm above, 10 µm below, bidentate, both teeth widely separated and similar in size or subdistal tooth longer and thicker than distal tooth, slender, fine, erect marginal spines, longer in dorsalmost chaetae (Fig. 13C). Dorsal simple chaetae from chaetiger 1–2, unidentate, provided with small, short subdistal marginal spines (Fig. 13B). Ventral simple chaetae from about chaetiger 17, smooth, sigmoid, strongly bidentate (Fig. 13D). Pharynx long, through about 6 segments; pharyngeal tooth small, nearly conical, located in front of midline of pharynx (Fig. 13A). Proventricle slightly shorter than pharynx, through about 5 segments, with 21–22 muscle cell rows. Pygidium with 2 anal cirri, similar to dorsal cirri.

Remarks. The types of this species come from Western Australia and agree with the specimens described above. The two specimens reported from Queensland by Hartmann-Schröder (1991) were examined; one, the figured specimen, is similar to *Salvatoria pilkena* n.sp. (see below) but it could represent another, undescribed species; the other specimen is *Sphaerosyllis bardukaciculata* n.sp. (see below).

Distribution. Australia (Western Australia, Victoria, New South Wales).

Habitat. Coarse and fine sand, sand and shell, to 29 m depth.

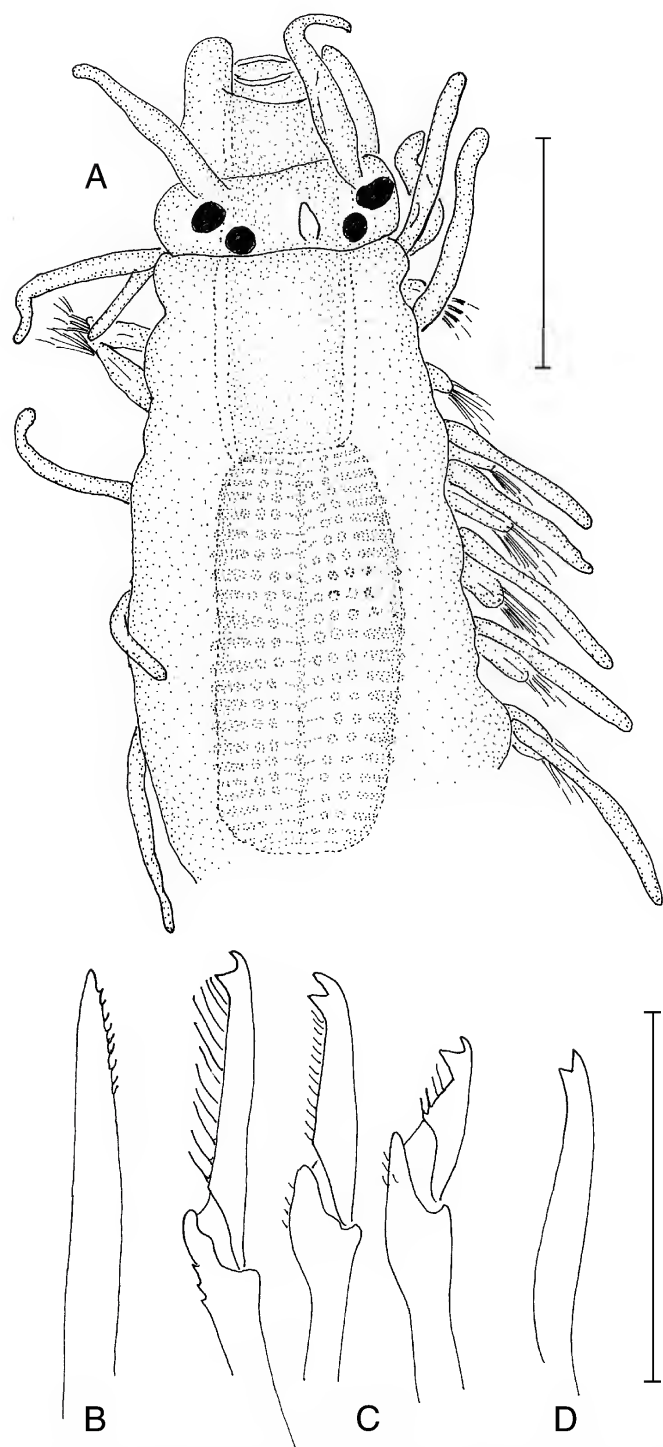


Fig. 13. *Salvatoria opisthodentata*. (A) anterior end, dorsal view (median antenna missing). (B) dorsal simple chaeta. (C) compound chaetae. (D) ventral simple chaeta. Scale A: 0.1 mm, B–D: 20 µm.

Salvatoria pilkena n.sp.

Fig. 14A–J

Material examined. AUSTRALIA: QUEENSLAND. HOLOTYPE: 1 specimen, AM W26886, Hinchinbrook Channel, 18°20'S 146°4'E, tidal mud- and sandflats, S. Dittmann, 22 Oct 1991. PARATYPE: 1 specimen, AM W27676, Hinchinbrook Channel, 18°20'S 146°4'E, tidal mud- and sandflats, S. Dittmann, 22 Oct 1991.

Description. Body small, holotype 2.2 mm long, 0.16 mm wide, 24 chaetigers. Prostomium ovate, distinctly wider than long; 4 eyes in trapezoidal arrangement, anterior eyespots not seen. Antennae small, rugose, more or less spindle-

shaped; median antenna inserted between posterior eyes, similar in length to combined length of prostomium and palps, lateral antennae shorter than median antenna, inserted in front of anterior eyes. Palps shorter than prostomium, dorsally fused by a thin membrane, with a distal notch (Fig. 14A). Two distinct ciliated nuchal organs between prostomium and peristomium; peristomium similar in length to following segments, tentacular cirri similar to antennae, dorsal tentacular cirri similar in length to lateral antennae, ventral ones shorter. Dorsal cirri similar to antennae and tentacular cirri, lacking on chaetiger 2 (Fig. 14A); dorsal cirri of chaetiger 1 longer than remaining, similar in length to median antenna, all other dorsal cirri relatively short, some longer on posterior parapodia (Fig. 14B). Ventral cirri short, digitiform, those of posterior parapodia slightly longer. Parapodia ending, as typically other species of the genus, in 3 distinct rounded papillae (Fig. 14F). Compound chaetae with smooth, slender shafts and blades; blades bidentate, both teeth acute, subdistal tooth shorter than distal tooth, provided with moderately long spines, upwards pointed; on bases of longer blades, distal half of margin smooth or provided with small spines. Anterior parapodia each with about 6 compound chaetae, strong dorsoventral gradation in length of blades (Fig. 14E), 24 µm above, 8 µm below, longer blades with a double curvature; posterior parapodia each with only 4 compound chaetae, less marked dorsoventral gradation (Fig. 14H), 20 µm above, 14 µm below. Dorsal simple chaetae from chaetiger 1, smooth, slender, apparently unidentate (Fig. 14C,G). Ventral simple chaetae only present on most posterior chaetigers, sigmoid, smooth, strongly bidentate (Fig. 14I). Acicula solitary, acuminate (Fig. 14D). Pharynx long, through about 4 segments; pharyngeal tooth small, located near anterior margin. Proventricle similar in length to prostomium, through 3 segments, with about 18 muscle cell rows. Pygidium small, slightly bilobed, with 2 anal cirri, similar to dorsal cirri.

Remarks. *Salvatoria pilkena* n.sp. belongs to a small group of species with rugose dorsal cirri, different from the typical spindle-shaped typical of the genus, and lacking dorsal cirri on chaetiger 2. *Salvatoria swedmarki* (Gidholm, 1962) and *S. celiae* (Parapar & San Martín, 1992) are similar, but they differ from *S. pilkena* in having much longer proventricles and in the compound chaetae, which are short and unidentate in *S. swedmarki* and strongly bidentate, with long marginal spines of blades in *S. celiae* (see Gidholm, 1962; Parapar & San Martín, 1992; and San Martín, 2003). The described and figured specimen of *S. opisthodentata* by Hartmann-Schröder (1991) has similar compound chaetae and body but it is figured as having dorsal cirri on chaetiger 2; this specimen has been examined and lacks dorsal cirri on chaetiger 2.

Distribution. Australia (Queensland).

Habitat. Tidal mud and sand flats.

Etymology. The specific name is an Aboriginal word, *pilkena*, meaning “different”, because of the unique features.

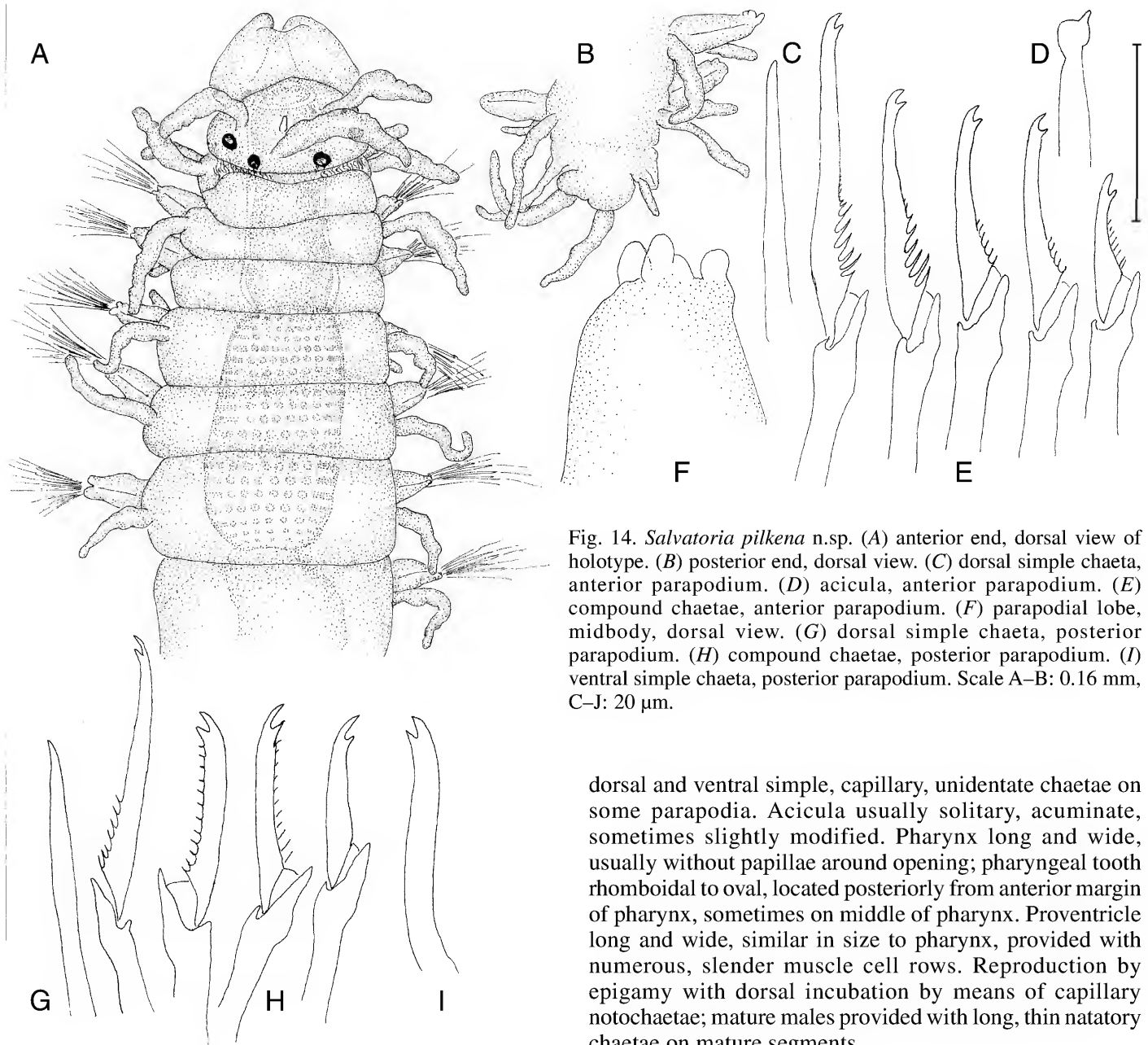


Fig. 14. *Salvatoria pilkena* n.sp. (A) anterior end, dorsal view of holotype. (B) posterior end, dorsal view. (C) dorsal simple chaeta, anterior parapodium. (D) acicula, anterior parapodium. (E) compound chaetae, anterior parapodium. (F) parapodial lobe, midbody, dorsal view. (G) dorsal simple chaeta, posterior parapodium. (H) compound chaetae, posterior parapodium. (I) ventral simple chaeta, posterior parapodium. Scale A–B: 0.16 mm, C–J: 20 µm.

dorsal and ventral simple, capillary, unidentate chaetae on some parapodia. Acicula usually solitary, acuminate, sometimes slightly modified. Pharynx long and wide, usually without papillae around opening; pharyngeal tooth rhomboidal to oval, located posteriorly from anterior margin of pharynx, sometimes on middle of pharynx. Proventricle long and wide, similar in size to pharynx, provided with numerous, slender muscle cell rows. Reproduction by epigamy with dorsal incubation by means of capillary notochaetae; mature males provided with long, thin natatory chaetae on mature segments.

Genus *Prosphaerosyllis* San Martín, 1984

Sphaerosyllis (*Prosphaerosyllis*) San Martín, 1984b: 377.

Diagnosis. Body small, with few segments, provided with dorsal and ventral papillae, also present on cirri and parapodia; usually covered by detritus; sometimes, some dorsal or ventral papillae long. Prostomium with 3 small, short antennae, 4 eyes, and 2 anterior eyespots, usually partially covered dorsally by peristomium, some species with the prostomium completely retracted inside peristomium. Palps fused along their length, short, slightly ventrally folded, provided with small papillae. Single pair of tentacular cirri, located ventrolaterally. Nuchal organs 2 small, ciliated lateral clefts, usually covered by peristomium and difficult to see. Antennae, tentacular and dorsal cirri short, pyriform to bulbous, with sphaerical bases and short tips that are usually retractile inside bases, especially in midbody and posterior parapodia; tips sometimes papilliform and short; dorsal cirri present on all parapodia. Parapodial glands absent. Parapodia with compound, heterogomph chaetae with unidentate, short, falcate blades;

Type species. *Sphaerosyllis xarifae* Hartmann-Schröder, 1960; designated by San Martín (1984b).

Remarks. *Prosphaerosyllis* was erected as a subgenus of *Sphaerosyllis* Claparède, 1863 for a group of species differing from the type species of the genus, *S. hystrix* Claparède, 1863, and other species included in the nominal subgenus *Sphaerosyllis*, in the shape and position of the pharyngeal tooth, shape of pharynx and proventricle, shape of dorsal cirri and presence of dorsal cirri on chaetiger 2. This differentiation, however, has not been universally accepted, as these taxa are “based on artificial characters more than important phylogenetic characters” (Russell, 1989; Westheide, 1990; Kudenov & Harris, 1995), although these authors do not analyze the characters of the genus and do not explain which characters are of phylogenetic importance, and which are not. Riser (1991) discussed the genus and recognized three groups of species, one of which mostly agrees with *Prosphaerosyllis*, but he considered this not relevant to the concept of subgenera in *Sphaerosyllis*. In fact, there is another character not considered by any of the above mentioned authors, the type of reproduction,

which is different in *Prosphaerosyllis* (females carrying eggs by means of capillary notochaeta) to that present in *Sphaerosyllis* (females without notochaetae, brooding ventrally eggs and juveniles). For the above reasons, I propose here that *Prosphaerosyllis* be elevated to genus level taxon.

All species of *Prosphaerosyllis* have similar chaetae; species identification is based principally on the shape of

dorsal cirri, position of pharyngeal tooth, and the arrangement of papillae; the papillae, however, can appear different when they are covered in debris, so the specimens must be cleaned before identification. Some species have papillae of three different sizes, short, moderate and long (see Fig. 17A,B) or of two sizes, short and moderate (see Figs. 15A, 16B,C).

Key to species of *Prosphaerosyllis* recorded from Australia

- 1 Some papillae on dorsum elongate, digitiform 2
 — All dorsal papillae similar, rounded 4
- 2 Papillae on dorsum of each segment, at least on midbody, arranged in transverse lines of 4–5 similar, moderately long papillae. Dorsal cirri of midbody similar to those of anterior parapodia but more elongate, similar in length to parapodial lobes *P. xarifae*
 — Dorsal papillae long. Dorsal cirri from midbody distinctly more elongate than antennae and anterior dorsal cirri 3
- 3 Two longitudinal rows of papillae close to midline of dorsum, and 2 longitudinal rows of similar, but distinctly shorter, papillae, between long papillae and dorsal cirri. Dorsal cirri from midbody moderately long, slightly longer than parapodial lobes *P. longipapillata*
 — All long dorsal papillae similar. Dorsal cirri from midbody long and slender, some distinctly longer than parapodial lobes *P. nathani*
- 4 Papillae small 5
 — Papillae large, similar to vesicles 8
- 5 Papillae on dorsum forming a V, with 3 small papillae on each side *P. sexpapillata*
 — Papillae irregularly distributed 6
- 6 All antennae on anterior margin of prostomium, close to eyespots *P. opisthoculata*
 — Median antenna inserted most posteriorly than lateral antennae 7
- 7 Pharynx long, through about 7 segments. Palps densely papillated and dorsum with few minute papillae. Eyes small *P. isabellae*
 — Pharynx short, through about 4 segments. Papillae distributed on palps and dorsum. Eyes large *P. magnoculata*
- 8 Papillae few, large, inflated and forming large vesicles *P. papillosissima*
 — Papillae numerous, smaller 9
- 9 Palps completely fused along their length. Dorsal cirri minute, papilliform. Prostomium and palps usually completely retracted into peristomium *P. multipapillata*
 — Palps fused but with a distinct distal notch. Dorsal cirri distinct, with a bulbous bases. Prostomium and palps not retracted into peristomium *P. battiri* n.sp.

Prosphaerosyllis xarifae (Hartmann-Schröder, 1960)

Figs. 15A–F, 16A–F

Sphaerosyllis xarifae Hartmann-Schröder, 1960: 103, figs. 121–124; 1979: 103, figs. 139–140; 1980a: 56; 1981: 37; 1984: 25; 1985: 72; 1991: 41. San Martín, 1984a: 236, fig. 54; 2003: 225, figs. 119, 120.

Material examined. AUSTRALIA: QUEENSLAND. 11 specimens, AM W26558, Halifax Bay, north of Townsville, 19°10'S 146°44'E, 5 m, Queensland Nickel Pty Ltd, July 1977. WESTERN AUSTRALIA. 1 specimen, AM W26726, off south end of Long Island, Beacon Island, 28°28.8'S

113°46.3'E, dead coral covered in coralline algae, 5 m, P.A. Hutchings, 25 May 1994. 2 specimens, AM W26727, jetty adjacent to Fisheries Hut, Beacon Island, 28°25.5'S 113°47.0'E, dead plate-coral—*Acropora* & *Montipora* spp., 12 m, P.A. Hutchings, 23 May 1994. 1 specimen, AM W26829, Bush Bay, 30 km south of Carnarvon, 25°10'S 113°39'E, tufted balls of algae on shallow sandflats, 0.5 m, H.E. Stoddart, 6 Jan 1984, WA 417. 2 specimens on SEM stub, AM W27893, inshore reef off Ned's Camp, Cape Range National Park, 21°59'S 113°59'E, frilly *Caulerpa* sp., 1 m, J.K. Lowry, 2 Jan 1984, WA 362.

Description. Body small 3.7 mm long, 0.2 mm wide, 31 chaetigers, broad anteriorly, provided with scattered, small dorsal (Figs. 15A, 16A,B) and ventral papillae; a row of 2–

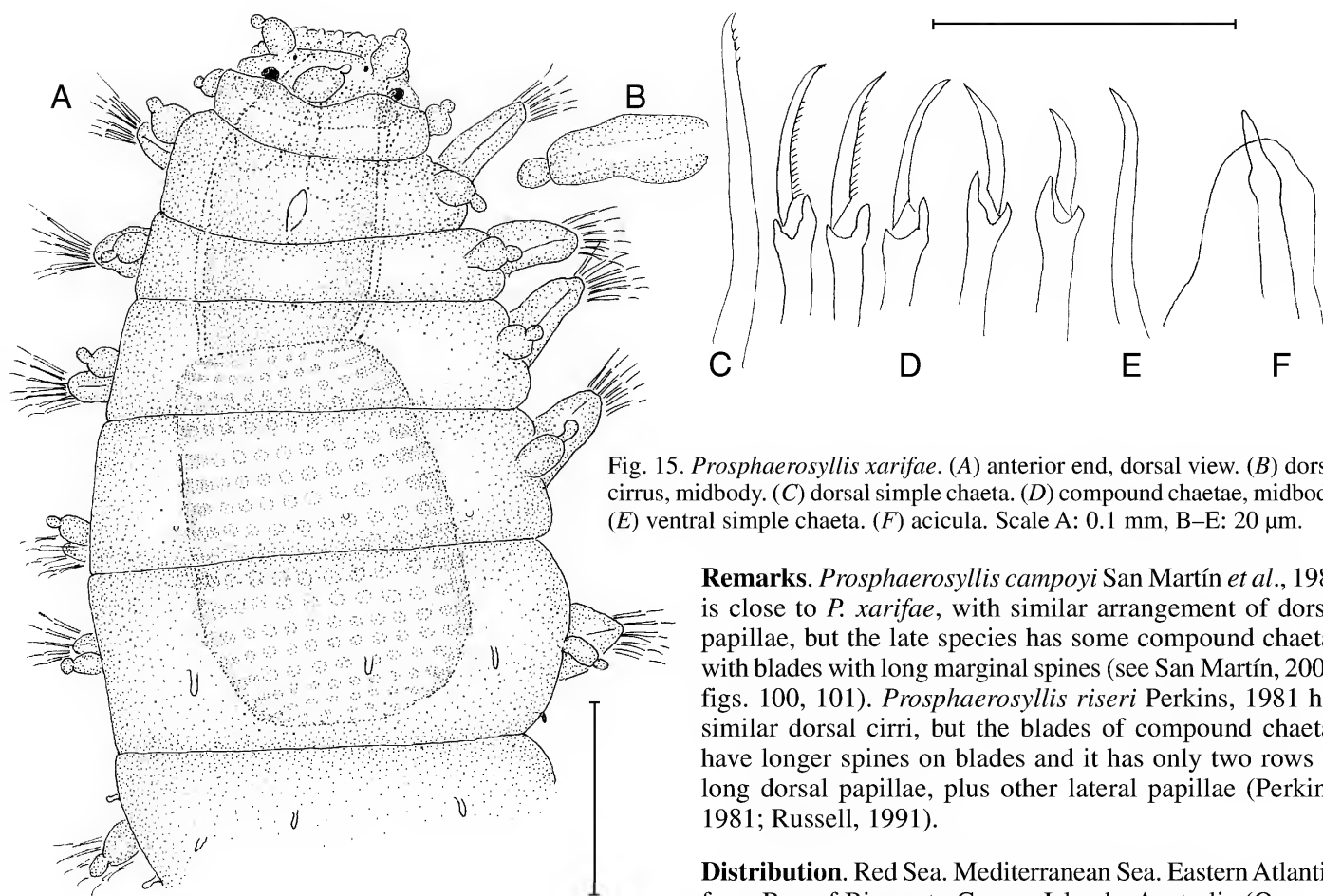


Fig. 15. *Prosphaerosyllis xarifae*. (A) anterior end, dorsal view. (B) dorsal cirrus, midbody. (C) dorsal simple chaeta. (D) compound chaetae, midbody. (E) ventral simple chaeta. (F) acicula. Scale A: 0.1 mm, B–E: 20 µm.

3 longer papillae on dorsum of each chaetiger from proventricular segments (Figs. 15A, 16C). Prostomium rectangular to oval; 4 large eyes in trapezoidal arrangement, close to each other on each side, and 2 anterior eyespots. Antennae small, pyriform, all similar in shape and size (Figs. 15A, 16B), with bulbous bases and short tip; lateral antennae inserted on anterior margin of prostomium, near eyespots, median antenna inserted between anterior eyes. Palps large, short, totally fused all along their length, with scattered papillae (Figs. 15A, 16B). Peristomium covering dorsally posterior margin of prostomium; tentacular cirri similar in shape to antennae, but smaller (Fig. 15A). Dorsal cirri on all segments; anterior dorsal cirri similar to antennae and tentacular cirri, with bulbous bases and short tip (Figs. 15A, 16B), bases elongate progressively posteriorly and tips become retractile (Figs. 15B, 16C,D); dorsal cirri of midbody slightly longer than parapodial lobes. Parapodial lobes relatively short, conical, with some small papillae (Fig. 16C–E). Compound chaetae heterogomph, with smooth shafts, and unidentate, thin blades, smooth or provided with short marginal spines of dorsal chaetae (Figs. 15D, 16F). Anterior parapodia each with 6 compound chaetae, diminishing to 4 on posterior parapodia. Slight dorsoventral gradation in size of blades, 20–13 µm on anterior parapodia, about 17–16 µm on posterior parapodia. Dorsal simple chaetae from anterior segments, usually from chaetiger 1, unidentate, with few, short subdistal spines (Fig. 15C). Ventral simple chaetae on posterior parapodia, sigmoid, unidentate, smooth (Fig. 15E). Acicula solitary, acuminate (Fig. 15F). Pharynx long and wide, through 4–5 segments; pharyngeal tooth oval, located near middle of pharynx (Fig. 15A). Proventricle similar in length and width to pharynx, through 3–4 segments, with 20–25 muscle cell rows.

Remarks. *Prosphaerosyllis campoyi* San Martín *et al.*, 1982 is close to *P. xarifae*, with similar arrangement of dorsal papillae, but the late species has some compound chaetae with blades with long marginal spines (see San Martín, 2003, figs. 100, 101). *Prosphaerosyllis riseri* Perkins, 1981 has similar dorsal cirri, but the blades of compound chaetae have longer spines on blades and it has only two rows of long dorsal papillae, plus other lateral papillae (Perkins, 1981; Russell, 1991).

Distribution. Red Sea. Mediterranean Sea. Eastern Atlantic, from Bay of Biscay to Canary Islands. Australia (Queensland, Western Australia, South Australia).

Habitat. Intertidal to about 40 m depth, on all kinds of substrates: algae, sand, mud, seagrasses, calcareous substrates.

Prosphaerosyllis longipapillata (Hartmann-Schröder, 1979)

Figs. 17A–G, 18A–H

Sphaerosyllis longipapillata Hartmann-Schröder, 1979: 106, figs. 148–150; 1982: 71; 1984: 23; 1985: 71; 1986: 43; 1991: 40. *Sphaerosyllis* (*Prosphaerosyllis*) *longipapillata*.—Hartmann-Schröder, 1987: 41.

Material examined. AUSTRALIA: NEW SOUTH WALES. 4 specimens, AM W484, Port Jackson, 33°51'S 151°16'E. 1 specimen, AM W12402, Careel Bay, Pittwater, 33°37'S 151°19'E, *Zostera* sp., P.A. Hutchings, 06 Sep 1973. 2 specimens, AM W15812, south bank of Lake Merimbula, 36°53.7'S 149°54.5'E, short *Zostera* & *Halophila* spp., J.H. Day & party, 06 Oct 1975. 1 specimen, AM W22624, Carama Inlet, Jervis Bay, 35°00'S 150°46.5'E, *Zostera capricorni*, L. Howitt, Mar 1989. 4 specimens, AM W23140, Honeymoon Bay, Jervis Bay, 35°03.8'S 150°45.4'E, unvegetated sediment, 20 m, P.A. Hutchings & party, 20 Feb 1989. 1 specimen, AM W23906, Port Hacking, 34°04.08'S 151°06.27'E, sand, 18.7 m, A M party, 27 Oct 1994. 1 specimen, AM W23922, Port Hacking, 34°04.17'S 151°06.41'E, sand, 16.4 m, AM party, 12 Jan 1995. 1 specimen, AM W23923, Pittwater, 33°35.84'S 151°18.33'E, sand, 15.3 m, AM party, 31 July 1995. 1 specimen, AM W23924, Port Hacking, 34°04.11'S 151°06.46'E, sand, 17.3 m, AM party, 12 Oct 1995. 19 specimens, AM W26645, Bottle and Glass Rocks, Port Jackson, 33°50.9'S 151°16.2'E, airlift, 12 m, G. Clark, 11 Dec 1989. 10 specimens, AM W26654, Grotto Point, Port Jackson, 33°49'S 151°15'E, algae, 4 m, P. Colman, 18 July 1983. 1 specimen, AM W26658, north east corner of Clark Island, 33°51.85'S 151°14.47'E, encrustation on outside of bottle, 5 m, P.A. Hutchings, 17 Apr 1996. 1 specimen, AM W26699, Weeney Bay, Botany Bay, 34°01.3'S 151°09.7'E, 1 m, A. Roach & A. Jones, 30 Mar 1995. 1 specimen, AM W26700, Green Point, Jervis Bay, 35°01.0'S 150°46.0'E, in *Zostera* & *Halophila*, 5 m, P.A. Hutchings,

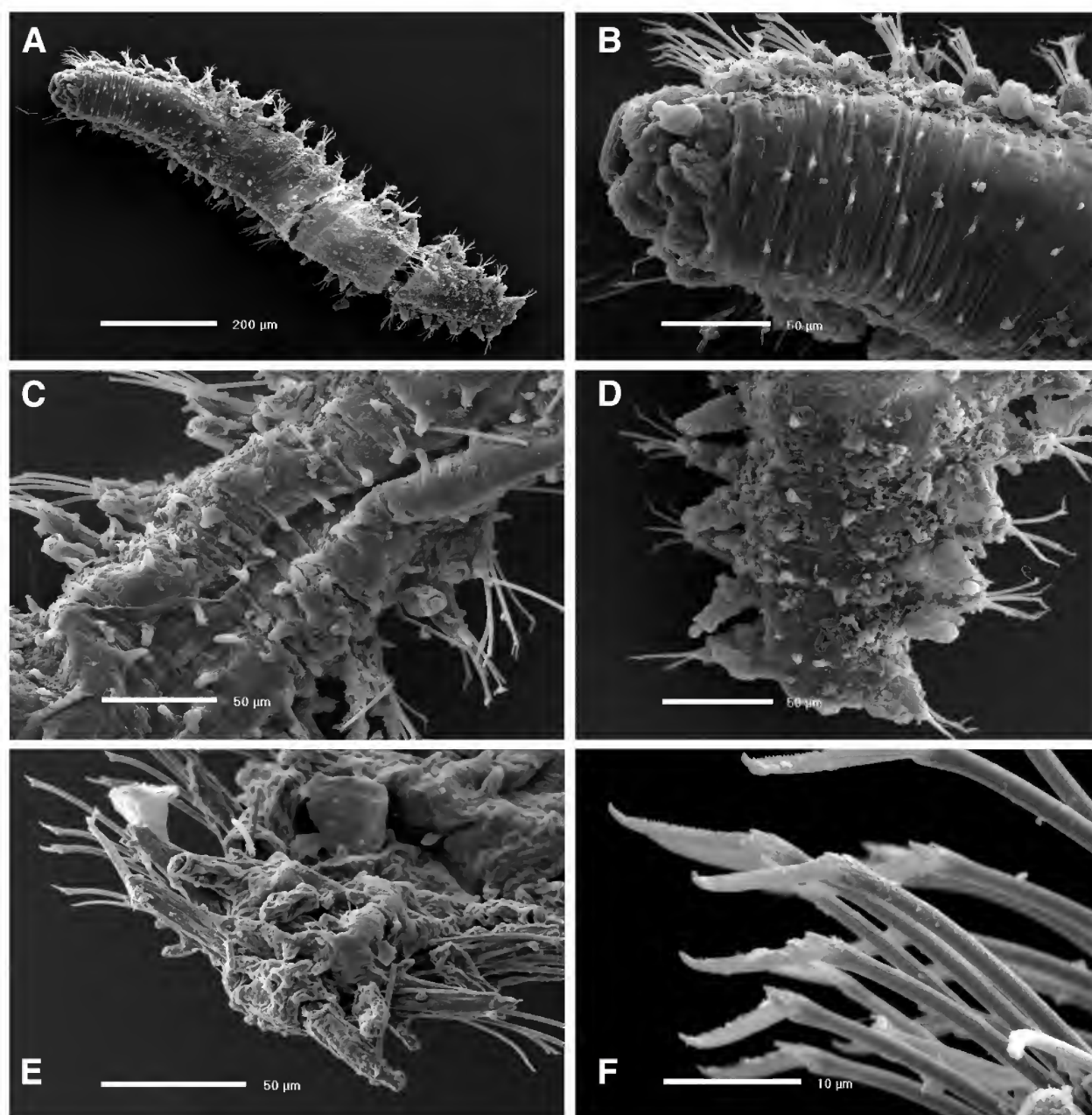


Fig. 16. SEM of *Prosphaerosyllis xarifae*. (A) dorsal view. (B) anterior end, dorsal view. (C) midbody segments, dorsal view. (D) posterior segments, dorsal view. (E) pygidium, posterior view. (F) chaetal bundle, midbody.

23 Jan 1973. 1 specimen, AM W26701, North Creek Canal, Richmond River, 28°52.1'S 153°32.8'E, mud, 3 m, P.B. Berents *et al.*, 02 Mar 1992. 1 specimen, AM W196422, Brooklyn Boat Channel, Hawkesbury River, 33°33'S 151°14'E, A. Jones & party, 16 May 1980. 1 specimen, AM W196423, Brooklyn Boat Channel, Hawkesbury River, 33°33'S 151°14'E, A. Jones & party, 21 Aug 1980. 1 specimen, AM W196424, Brooklyn Boat Channel, Hawkesbury River, 33°33'S 151°14'E, A. Jones & party, 21 Aug 1980. 1 specimen, AM W196425, east end Brooklyn Boat Channel, Hawkesbury River, 33°33'S 151°14'E, A. Jones & party, 18 Dec 1979. 2 specimens, AM W196426, east end Brooklyn Boat Channel, Hawkesbury River, 33°33'S 151°14'E, A. Jones & party, 16 May 1980. 5 specimens, AM W196427, east end Brooklyn Boat Channel, Hawkesbury River, 33°33'S 151°14'E, A. Jones & party, 21 Aug 1980. 1 specimen, AM W196428, east end Brooklyn Boat Channel, Hawkesbury River, 33°33'S 151°14'E, A. Jones & party, 21 Aug 1980. 4 specimens, AM W196429, 0.5 km east of Dangar Island, Hawkesbury River, 33°33'S 150°14'E, A. Jones & party, 21 Aug 1980. 1 specimen, AM W196430, 0.5 km east of Dangar Island, Hawkesbury River, 33°33'S 150°14'E, A. Jones & party, 21 Aug 1980. 1 specimen, AM W196432, Brooklyn Boat Channel, Hawkesbury River, 33°33'S 151°14'E, A. Jones & party, 18 Dec 1979. VICTORIA. 1 specimen, AM W4504, Bass Strait, 38°59'S 148°34'E, globerina clay, 466 m, C. Phipps, May 1969. 1 specimen, AM W16235, Port Phillip Bay, 38°21.0'S 144°51.5'E, sand, 9 m, 09 Dec 1971. 1 specimen, MV F87427, Port Phillip Bay, off Port Arlington, 38°07.0'S 144°41.3'E, sand, 2 m depth, 10 Jun 1971. TASMANIA. 1

specimen, AM W23143, next to jetty at boat ramp, Dover, Port Esperance, 43°19'S 147°01.5'E, *Heterozostera* & surface sediment, 1.5 m, P.B. Berents, 19 Apr 1991. SOUTH AUSTRALIA. 5 specimens, AM W26748, Elliston Reef, 33°39'S 134°53'E, algal washings, P.A. Hutchings, 11 Mar 1979. 1 specimen, AM W26749, Elliston Reef, 33°39'S 134°53'E, algae from reef flat at low tide, P.A. Hutchings, 11 Mar 1979. 32 specimens, AM W26750, Billy Lights Point, Port Lincoln, 34°45'S 135°53'E, stone washings from sheltered intertidal rocks, I. Loch, 15 Feb 1985. WESTERN AUSTRALIA. 1 specimen, AM W26820, inshore reef, Ned's Camp, Cape Range National Park, 21°59'S 113°55'E, black sponge, 1.5 m, J.K. Lowry, 2 Jan 1984. 2 specimens, AM W26834, 5 km offshore, Bush Bay, 30 km south of Carnarvon, 25°10'S 113°39'E, airlift in strap-leaved seagrass beds, 2 m, J.K. Lowry & R.T. Springthorpe, 6 Jan 1984. 3 specimens, AM W27118, north end of Long Island, Goss Passage, 28°28.3'S 113°46.3'E, dead coral covered with coralline algae & boring bivalves, 8 m, C. Bryce, 22 May 1994. 1 specimen, AM W27119, Wallabi Island group, 28°23.98'S 113°46.73'E, rubble, medium sand from scallop beds, 40 m, P.A. Hutchings on FRV "Flinders", 28 May 1994. 1 specimen, AM W27120, Wallabi Island group, 28°23.61'S 113°45.09'E, scallop beds, shell & sponge debris, 35 m, P.A. Hutchings on FRV "Flinders", 30 May 1994. 1 specimen, AM W27651, limestone reef, off Ned's camp, Cape Range National Park, 21°59'S 113°55'E, sponge with epiphytic algae, and muddy worm tubes, 1.5 m, R.T. Springthorpe, 2 Jan 1984. 7 specimens, AM W27656, inshore reef off Ned's Camp, Cape Range National Park, 21°59'S 113°59'E, frilly

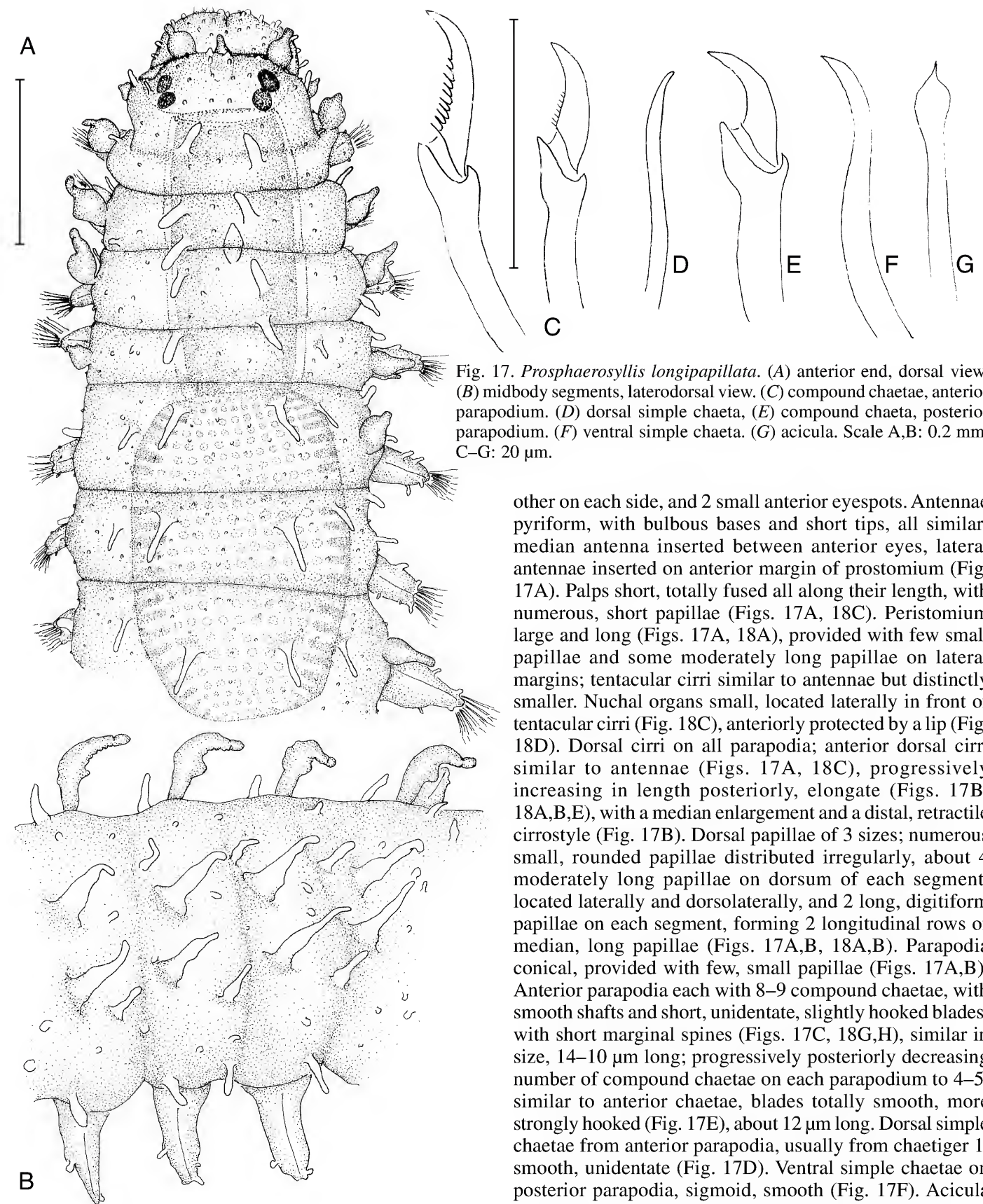


Fig. 17. *Prosphaerosyllis longipapillata*. (A) anterior end, dorsal view. (B) midbody segments, laterodorsal view. (C) compound chaetae, anterior parapodium. (D) dorsal simple chaeta, (E) compound chaeta, posterior parapodium. (F) ventral simple chaeta. (G) acicula. Scale A,B: 0.2 mm, C–G: 20 µm.

other on each side, and 2 small anterior eyespots. Antennae pyriform, with bulbous bases and short tips, all similar; median antenna inserted between anterior eyes, lateral antennae inserted on anterior margin of prostomium (Fig. 17A). Palps short, totally fused all along their length, with numerous, short papillae (Figs. 17A, 18C). Peristomium large and long (Figs. 17A, 18A), provided with few small papillae and some moderately long papillae on lateral margins; tentacular cirri similar to antennae but distinctly smaller. Nuchal organs small, located laterally in front of tentacular cirri (Fig. 18C), anteriorly protected by a lip (Fig. 18D). Dorsal cirri on all parapodia; anterior dorsal cirri similar to antennae (Figs. 17A, 18C), progressively increasing in length posteriorly, elongate (Figs. 17B, 18A,B,E), with a median enlargement and a distal, retractile cirrostyle (Fig. 17B). Dorsal papillae of 3 sizes; numerous small, rounded papillae distributed irregularly, about 4 moderately long papillae on dorsum of each segment, located laterally and dorsolaterally, and 2 long, digitiform papillae on each segment, forming 2 longitudinal rows of median, long papillae (Figs. 17A,B, 18A,B). Parapodia conical, provided with few, small papillae (Figs. 17A,B). Anterior parapodia each with 8–9 compound chaetae, with smooth shafts and short, unidentate, slightly hooked blades, with short marginal spines (Figs. 17C, 18G,H), similar in size, 14–10 µm long; progressively posteriorly decreasing number of compound chaetae on each parapodium to 4–5, similar to anterior chaetae, blades totally smooth, more strongly hooked (Fig. 17E), about 12 µm long. Dorsal simple chaetae from anterior parapodia, usually from chaetiger 1, smooth, unidentate (Fig. 17D). Ventral simple chaetae on posterior parapodia, sigmoid, smooth (Fig. 17F). Acicula solitary, acuminate (Fig. 17G). Pharynx through 4–5 segments; pharyngeal tooth ovate, located about on midline of pharynx (Fig. 17A). Proventricle similar in size to pharynx, through 3 segments, with about 22 muscle cell rows.

Distribution. Australia (all States).

Remarks. The species *Prosphaerosyllis bilineata* (Kudenov & Harris, 1995), from California, is similar but the

Caulerpa sp., 1 m, J.K. Lowry, 2 Jan 1984.1 specimen, AM W27665, reef west of groyne, 2 km south of Cape Peron, 32°16'S 115°41'E, orange sponge in deep channel of limestone reef, 4.5 m, R.T. Springthorpe, 26 Dec 1983.

Description. Body small, short, 3.5 mm long, 0.3 mm wide, 28–30 chaetigers, usually covered by debris (Fig. 18B,F). Prostomium rectangular to oval, wider than long, usually partially or totally covered by dorsal fold of peristomium, with 4 large eyes in trapezoidal arrangement, close to each

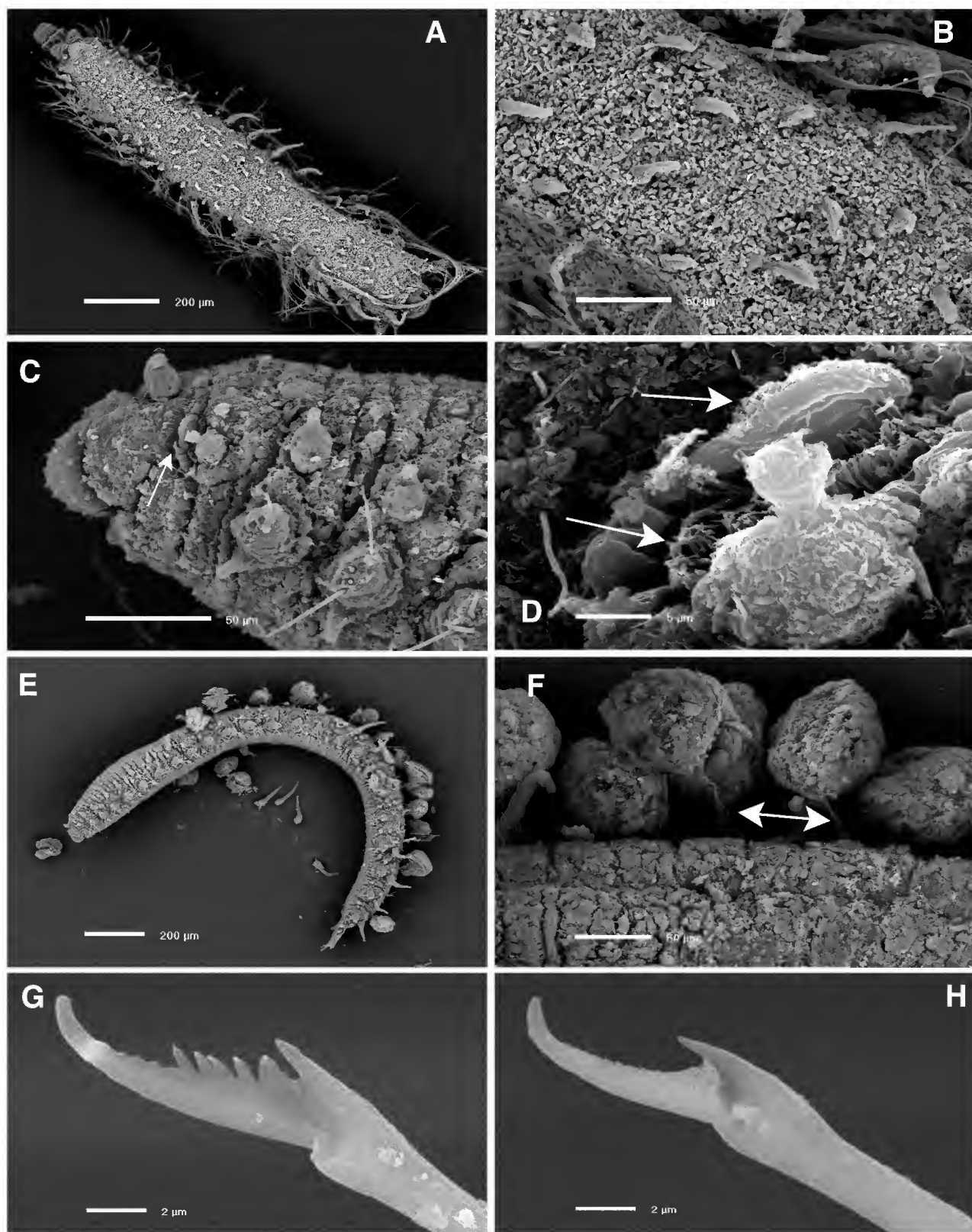


Fig. 18. SEM of *Prosphaerosyllis longipapillata*. (A) dorsal view of a mature male with natatory notochaetae. (B) dorsum, midbody. (C) prostomium, peristomium and most anterior segments, lateral view. (D) detail of nuchal organ and tentacular cirrus. (E) mature female carrying eggs, lateral view. (F) detail of the eggs, attached by means of capillary notochaetae. (G) anterior compound chaeta. (H) posterior compound chaeta.

arrangement of dorsal papillae appear to be slightly different. Also, *Prosphaerosyllis chinensis* (Jing & Wu, 1991) appears to be close to *P. longipapillata*, with similar arrangement of dorsal papillae (Jing & Wu, 1991).

Habitat. Common on all substrates, from corals to mud; occurs from intertidal to 466 m depth.

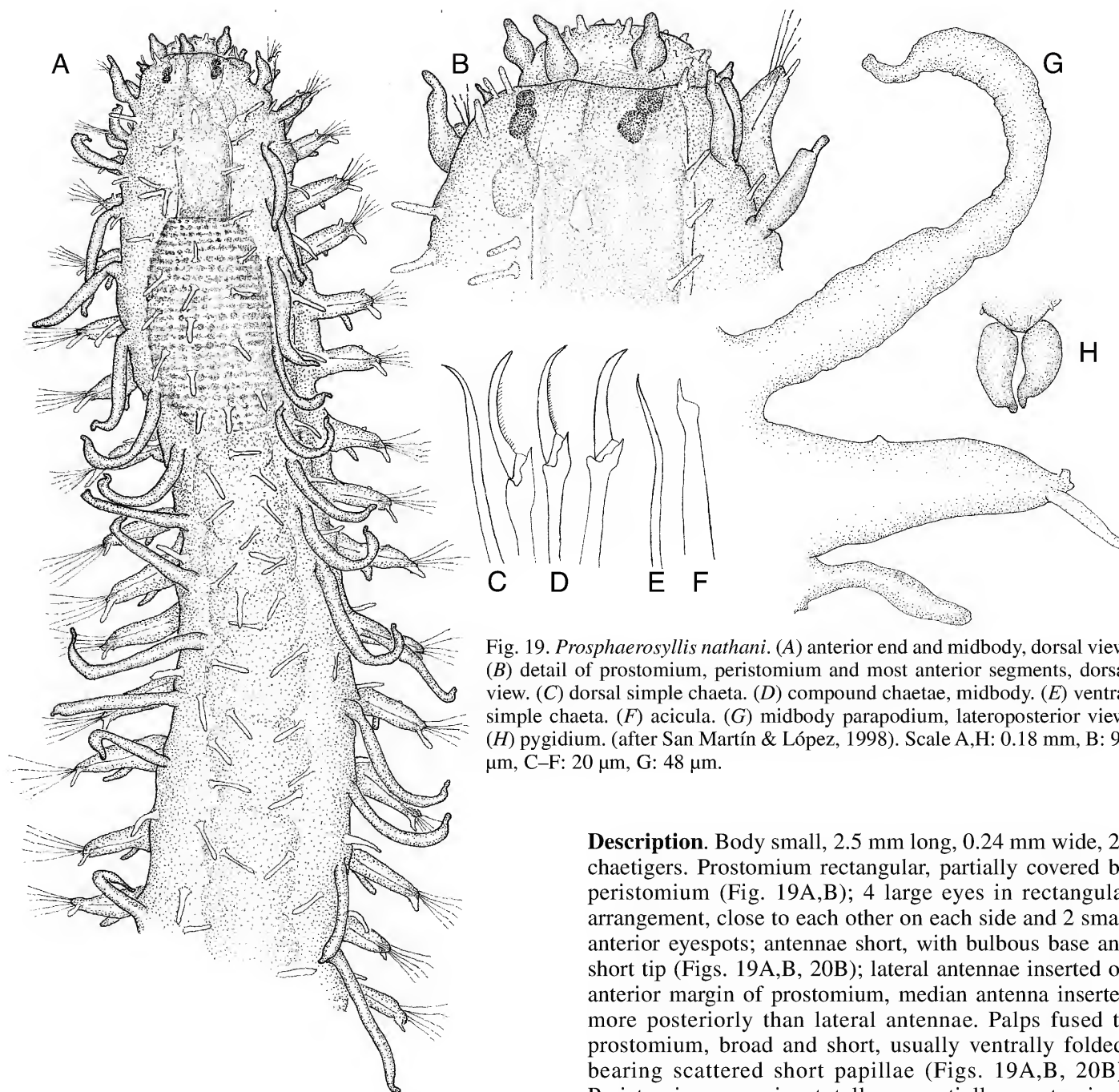


Fig. 19. *Prosphaerosyllis nathani*. (A) anterior end and midbody, dorsal view. (B) detail of prostomium, peristomium and most anterior segments, dorsal view. (C) dorsal simple chaeta. (D) compound chaetae, midbody. (E) ventral simple chaeta. (F) acicula. (G) midbody parapodium, lateroposterior view. (H) pygidium. (after San Martín & López, 1998). Scale A,H: 0.18 mm, B: 98 μ m, C–F: 20 μ m, G: 48 μ m.

***Prosphaerosyllis nathani* San Martín & López, 1998**

Figs. 19A–H, 20A–D

Sphaerosyllis (*Prosphaerosyllis*) *nathani* San Martín & López, 1998: 241, fig. 1.

Material examined. AUSTRALIA: NEW SOUTH WALES. HOLOTYPE: AM W22146, 300 m north east of Green Point, Hawkesbury River, 33°34'S 151°13.5'E, sandy mud, 5 m, A.R. Jones & A. Murray, 11 Feb 1981. 1 specimen, AM W196433, Green Point—Croppy Point, Hawkesbury River, 33°33.5'S 151°14.5'E, mud, 6 m, A. Jones *et al.*, 03 Nov 1977. QUEENSLAND. 1 specimen, AM W26564, Halifax Bay, north of Townsville, 19°9'S 146°37'E, 5 m, Queensland Nickel Pty Ltd, July 1977. TASMANIA. 1 specimen on SEM stub, AM W27988, north end of beach, Parsons Cove, Freycinet National Park, 42°08.6'S 148°16.9'E, clean gravelly sand, intertidal, N.W. Riser, 24 Jan 1986. WESTERN AUSTRALIA. Paratype: 1 specimens, AM W23142, reef south of Lucas Island, 15°16'S 124°29'E, 2 m, P.A. Hutchings, 24 July 1988. 1 specimen, AM W26715, off end of South Mole, Arthur Head, Fremantle, 32°03'S 115°44'E, orange tunicates, 6 m, J.K. Lowry, 25 Dec 1983.

Additional material. NEW ZEALAND. Paratype: 1 specimens, AM W23483, Kaikoura, 42°24'S 173°41'E, holdfast of *Laminaria*, N.W. Riser.

Description. Body small, 2.5 mm long, 0.24 mm wide, 28 chaetigers. Prostomium rectangular, partially covered by peristomium (Fig. 19A,B); 4 large eyes in rectangular arrangement, close to each other on each side and 2 small anterior eyespots; antennae short, with bulbous base and short tip (Figs. 19A,B, 20B); lateral antennae inserted on anterior margin of prostomium, median antenna inserted more posteriorly than lateral antennae. Palps fused to prostomium, broad and short, usually ventrally folded, bearing scattered short papillae (Figs. 19A,B, 20B). Peristomium covering totally or partially prostomium; tentacular cirri similar in shape to antennae but smaller (Figs. 19A,B, 20B). Dorsum covered by debris; dorsal papillae long, thin, digitiform, arranged in 3 irregular dorsal rows (Fig. 19A); each segment also bearing solitary papilla dorsolaterally between dorsal cirri; as result, there are 5 papillae dorsally visible on each segment (Figs. 19A, 20C). Ventral side with long papillae, similar to dorsal papillae, also arranged in 5 irregular rows. Dorsal cirri on all chaetigers; dorsal cirri of anterior segments slightly elongate in some specimens, similar in length to parapodial lobes (Figs. 19A,B), shorter in other specimens, similar to antennae (Fig. 20B); those of remaining segments proportionally long, distinctly longer than parapodial lobes (Figs. 19A,G, 20A,C); dorsal cirri becoming shorter at posterior end of body. Ventral cirri relatively long, digitiform. Parapodial lobes elongate, conical, each with small anterior papilla, inconspicuous prechaetal papilla and long postchaetal papilla (Figs. 19A,G). Parapodia each with about 4 compound chaetae, similar throughout, heterogomph, with blades unidentate and slightly falciform (Fig. 20D), dorsal blades with short marginal spines, ventral ones

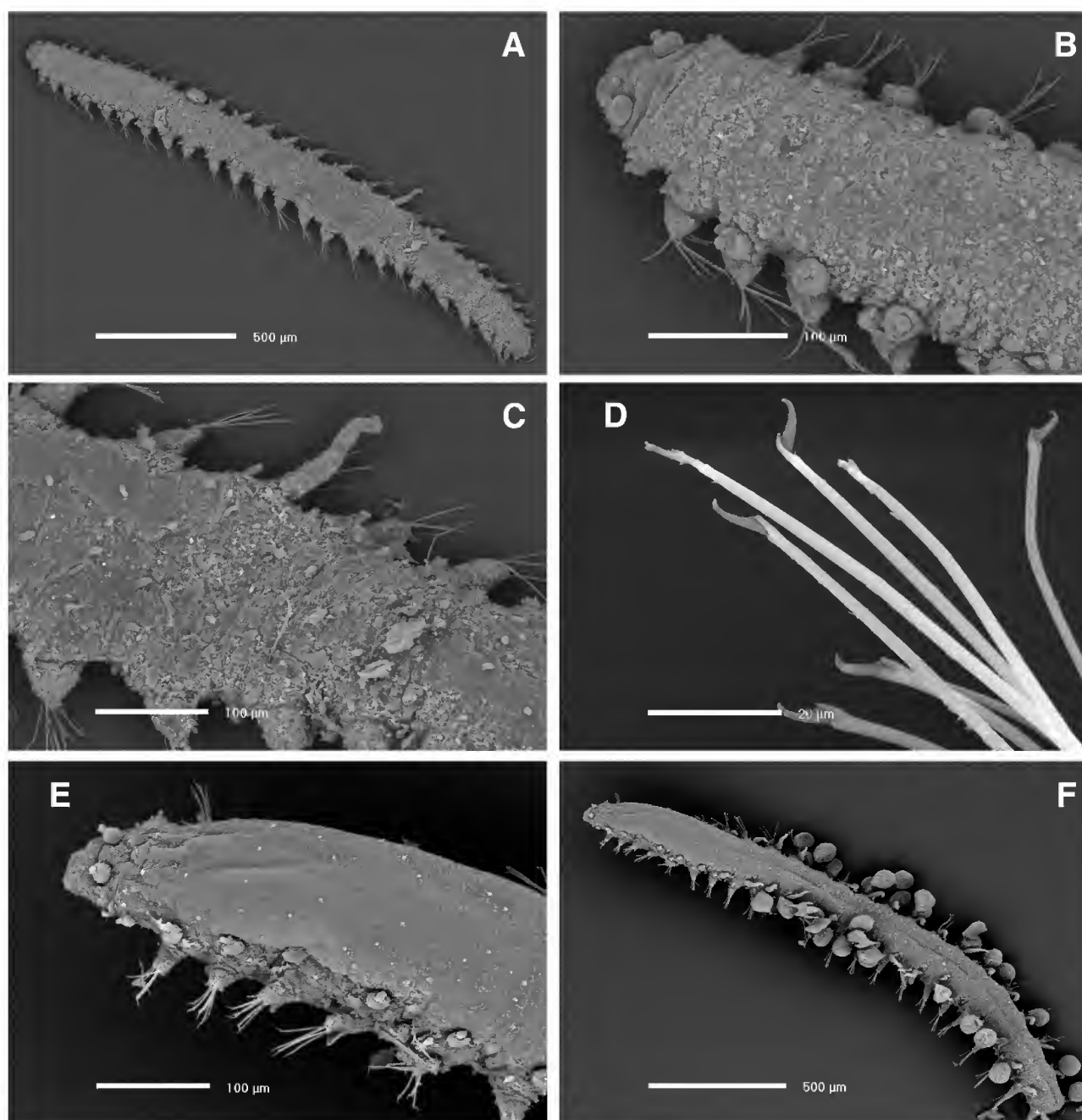


Fig. 20. SEM of *Prosphaerosyllis nathani*. (A) dorsal view of a female, carrying two eggs dorsally. (B) anterior end, dorsal view (median antenna missing). (C) midbody, dorsal view. (D) chaetal bundle, midbody. SEM of *Prosphaerosyllis sexpapillata*. (E) anterior end, laterodorsal view. (F) dorsal view of a mature female, carrying eggs.

smooth (Fig. 19D); all blades about 16 µm long. Dorsal simple chaetae from chaetiger 1, thin, smooth, sigmoid (Fig. 19C). Ventral simple chaetae on posterior parapodia, similar to dorsal one (Fig. 19E). Acicula solitary, acuminate (Fig. 19F). Pygidium semi-circular, with two long, thick anal cirri (Fig. 19H). Pharynx through about 4 segments; pharyngeal tooth oval, located well posteriorly from anterior margin, just anteriorly to middle of pharynx (Figs. 19A,B). Proventricle long and wide, through 3–4 segments, with 25 muscle cell rows.

Distribution. Australia (New South Wales, Queensland, Western Australia). New Zealand.

Habitat. Mud, sand, also on tunicates and holdfasts; on shallow depths.

***Prosphaerosyllis sexpapillata*
(Hartmann-Schröder, 1979)**

Figs. 20E–F, 21A–H

Sphaerosyllis sexpapillata Hartmann-Schröder, 1979: 105, figs. 144–147; 1980a: 55; 1981: 37; 1982: 72; 1983: 135; 1984: 24; 1985: 72; 1986: 43; 1989: 30; 1990: 54.

Sphaerosyllis (Prosphaerosyllis) sexpapillata.—Hartmann-Schröder, 1987: 42.

Material examined. AUSTRALIA: TASMANIA. 6 specimens, AM W27672, north end of beach, Parsons Cove, Freycinet National Park, 42°08.6'S 148°16.9'E, coarse gravel, intertidal, 24 Jan 1986, N.W. Riser. WESTERN AUSTRALIA. 1 specimen, HZM P-17068, Rockingham, Point Peron, G. Hartmann-Schröder.

Description. Body small, up to 2.6 mm long, 0.55 mm wide, 25 chaetigers, broad anteriorly, provided with scattered, small dorsal and ventral papillae (Figs. 20E, 21A) on

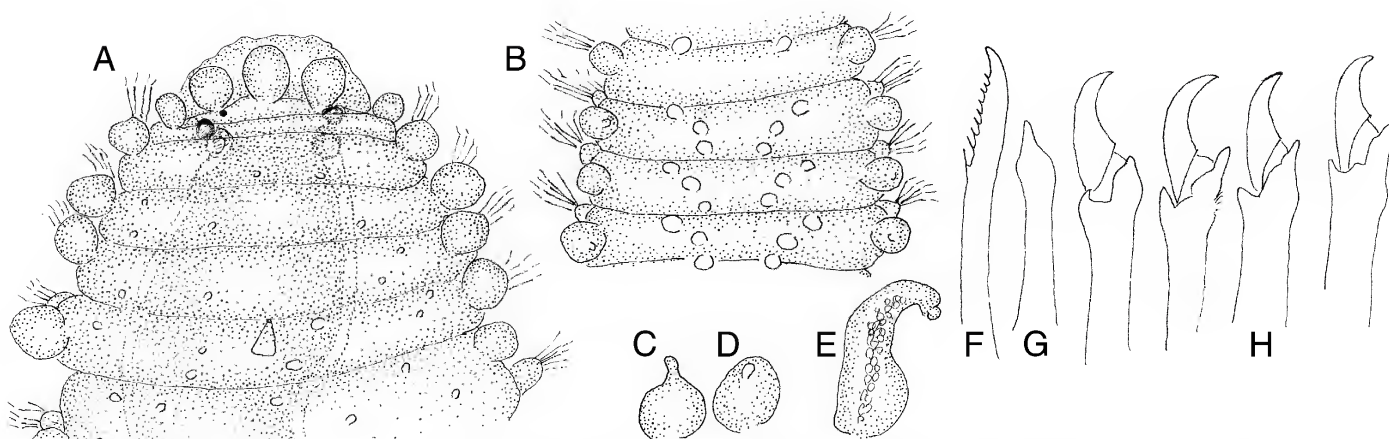


Fig. 21. *Prosphaerosyllis sexpapillata*. (A) anterior end, dorsal view. (B) anterior segments, dorsal view. (C) anterior dorsal cirrus, lateral view. (D) same, dorsal view. (E) midbody dorsal cirrus, lateral view. (F) dorsal simple chaeta. (G) acicula. (H) compound chaetae. A,B, modified from Hartmann-Schröder (1979). Scale C,D: 0.1 mm, F–H: 20 μ m.

anterior segments; from proventricular level, each segment provided dorsally with 6 small papillae, arranged forming a “V”, 3 on each side of segment (Figs. 20E,F, 21B). Prostomium oval, longer than wide, nearly completely covered by peristomium; 4 large eyes in trapezoidal arrangement and 2 anterior eyespots. Antennae small, pyriform to sphaerical, all similar in shape and size (Figs. 20E, 21A), with bulbous bases and minute, indistinct tip; all antennae inserted in line, in front of eyespots (Fig. 21A). Palps large, short, totally fused all along their length, with a few papillae (Fig. 21A). Peristomium covering dorsally almost all prostomium; tentacular cirri similar in shape to antennae, but smaller (Figs. 20E, 21A). Dorsal cirri on all segments, similar to antennae anteriorly, appearing sphaerical (Fig. 21A) but provided with a short, small tip (Figs. 20E, 21C,D); from midbody posteriorly, dorsal cirri slightly elongate (Fig. 20F), with a distal, retractile tip and an internal, dark gland (Fig. 21E). Parapodial lobes relatively short. Compound chaetae heterogomph, with strong articulation, with smooth shafts, and unidentate, short blades, smooth (Fig. 21H). Anterior parapodia each with 7–8 compound chaetae, diminishing to 3–4 on posterior parapodia. All blades similar in size, 10–12 μ m on anterior parapodia, slightly shorter on posterior parapodia. Dorsal simple chaetae from anterior segments, usually from chaetiger 1, unidentate, with few, short subdistal spines (Fig. 21F). Ventral simple chaetae on posterior parapodia, sigmoid, smooth (not seen in the examined specimen). Acicula solitary, acuminate (Fig. 21G). Pharynx wide, through 5 segments; pharyngeal tooth oval, located just posteriorly to middle of pharynx (Fig. 21A). Proventricle similar in length and width to pharynx, through 3 segments, with 18–20 muscle cell rows.

Remarks. This species is similar to *P. longipapillata* Hartmann-Schröder, 1979 and *P. nathani* San Martín & López, 1998, differing mainly in having small papillae, arranged forming a V on dorsum of each segment instead of rows of long papillae. *Prosphaerosyllis pumila* (Westheide, 1974) from Galápagos Islands is similar in having all the antennae inserted on anterior margin of prostomium, but the dorsal cirri are similar throughout, with longer tips than those of *P. sexpapillata* and the pharyngeal tooth is much smaller, located more anteriorly in the pharynx (Westheide, 1974).

One specimen from Tasmania, used for SEM photographs, agrees well with the above description, although the median antenna is missing and it is difficult to say if it is anterior or not on prostomium. That specimen is a mature female, carrying eggs dorsally. In the original description, the elongation of dorsal cirri from midbody was omitted, but it is present both in the examined specimen from HZM (P-17068) as well as in the specimen used for SEM examination.

Distribution. Australia (Western and South Australia, New South Wales, Queensland).

Habitat. Amongst algae, sediments. Intertidal and shallow depths.

***Prosphaerosyllis opisthocolata*
(Hartmann-Schröder, 1979) n.comb.**

Fig. 22A–G

Sphaerosyllis opisthocolata Hartmann-Schröder, 1979: 106, figs. 151–153; 1984: 24; 1985: 71; 1991: 40.

Material examined. No material examined.

Description. (Based on original description). Body small, 2 mm long, 20 chaetigers. Papillae small, few and scattered. Prostomium almost totally covered by peristomium; antennae small, inserted on anterior margin of prostomium, near eyespots (Fig. 22A), median antenna slightly posteriorly to lateral antennae. Eyes large, coalescent to each other on each side, located on the posterior part of prostomium, on level of chaetiger 1 (Fig. 22A). Tentacular cirri small, similar to antennae. Dorsal cirri on all parapodia, those of anterior segments short, with bulbous bases and distally slightly elongate. Compound chaetae hemigomph, with short, smooth, unidentate blades (Figs. 22C, 22F). Dorsal simple chaetae unidentate (Figs. 22B, 22E), from chaetiger 1. Ventral simple chaetae similar to dorsal (Fig. 22D,G). Pharynx through 4 segments; pharyngeal tooth located near anterior rim. Proventricle through 3 segments, with 17 muscle cell rows.

Remarks. Although this species was described in *Sphaerosyllis*, all characters agree with the above diagnosis of *Prosphaerosyllis* and it is transferred to that genus.

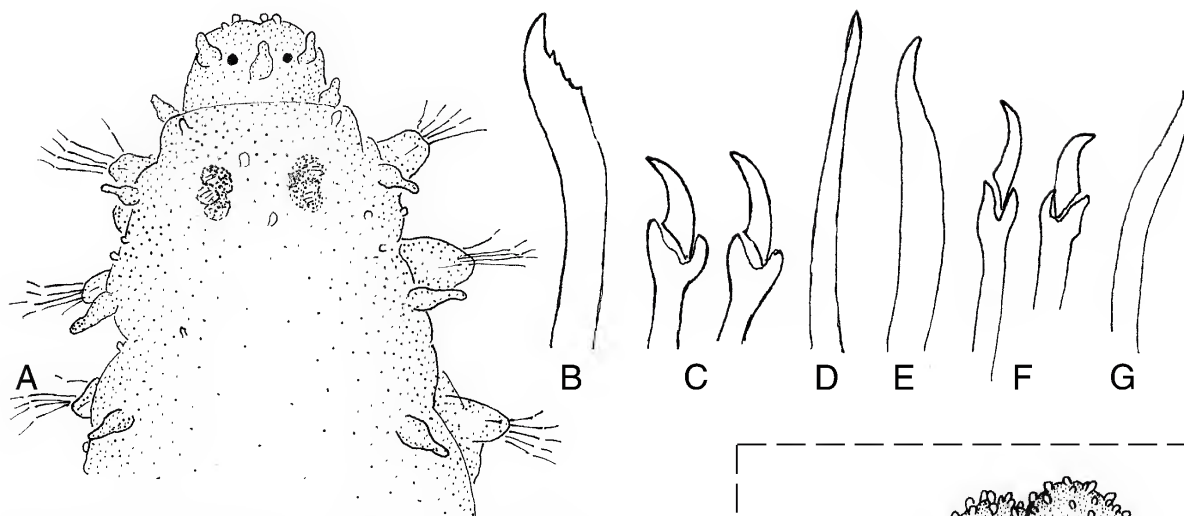


Fig. 22. *Prosphaerosyllis opisthocolata*. (A) anterior end, dorsal view. (B) dorsal simple chaeta, anterior parapodium. (C) compound chaetae, anterior parapodium. (D) ventral simple chaeta, anterior parapodium. (E) dorsal simple chaeta, posterior parapodium. (F) compound chaetae, posterior parapodium. (G) ventral simple chaeta, posterior parapodium. Modified from Hartmann-Schröder (1979).

Distribution. Australia (Western Australia, South Australia, Queensland).

Habitat. Intertidal sand.

***Prosphaerosyllis isabellae*
(Nogueira, San Martín & Amaral, 2001) n.comb.**

Fig. 23A–E

Sphaerosyllis isabellae Nogueira *et al.*, 2001: 1777, fig. 1.
Sphaerosyllis magnoculata Not Hartmann-Schröder, 1986.
Hartmann-Schröder, 1989: 29, fig. 37.

Material examined. AUSTRALIA: WESTERN AUSTRALIA. 1 specimen, AM W26620, north end of Long Island, Goss Passage, 28°27.9'S 113°46.3'E, dead coral covered in coralline algae & brown algae, 6 m, C. Bryce, 22 May 1994. 1 specimen, AM W26621, south east end of Long Island, Goss Passage, 28°28.8'S 113°46.5'E, dead coral substrate, embedded in calcareous substrate, 30 m, P.A. Hutchings, 22 May 1994.

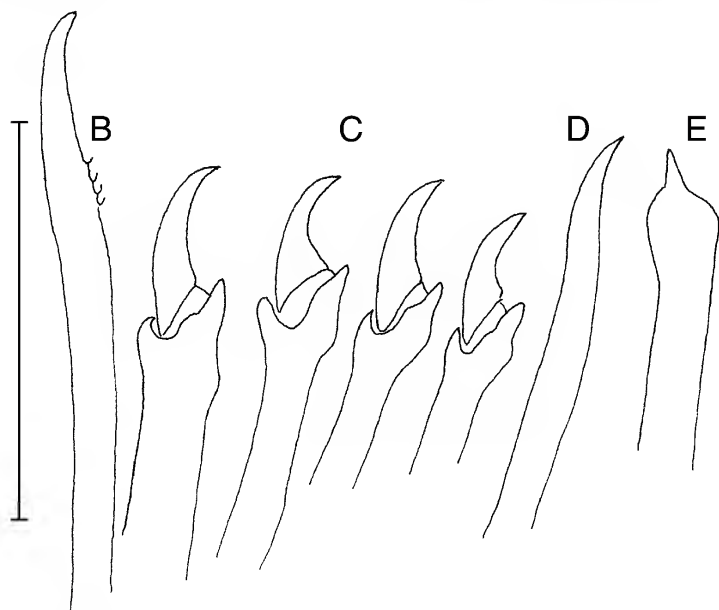
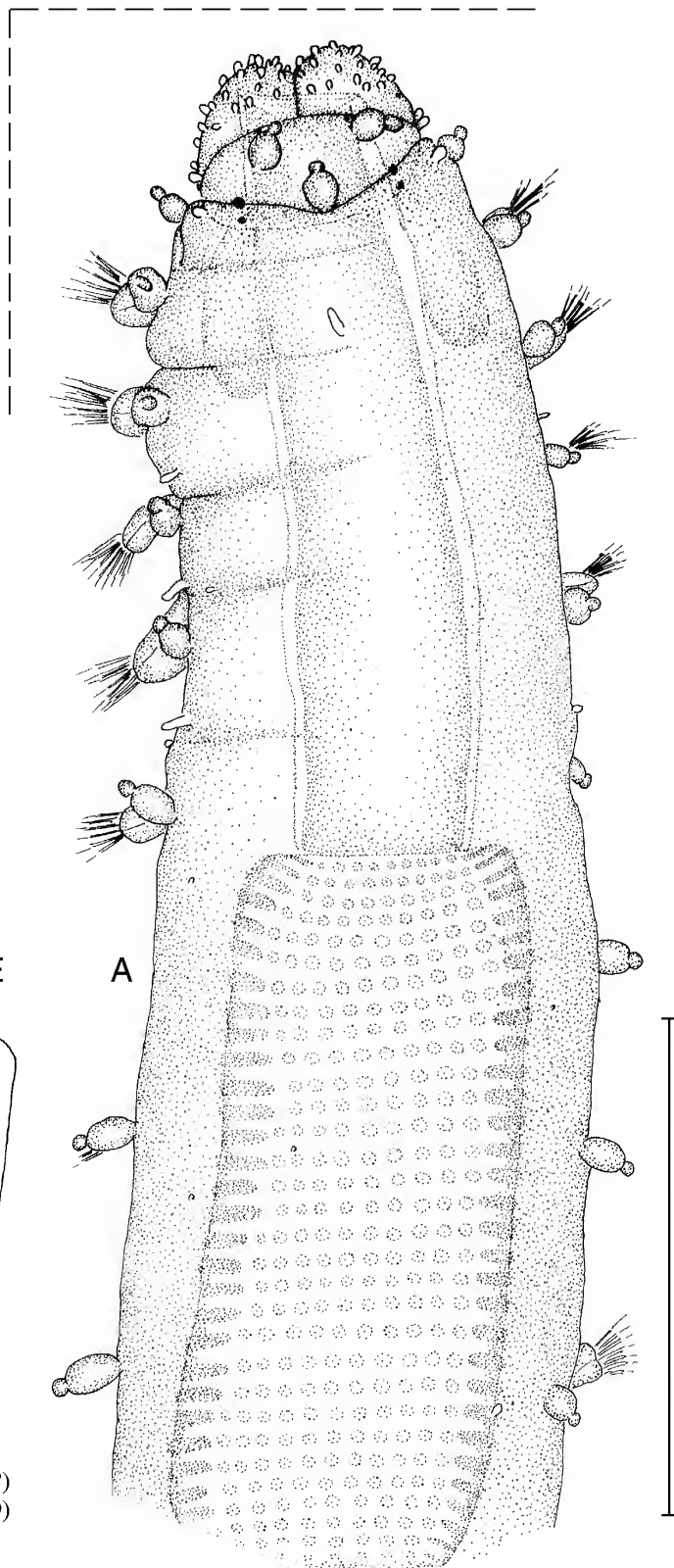


Fig. 23. *Prosphaerosyllis isabellae*. (A) anterior end, dorsal view. (B) dorsal simple chaeta, midbody. (C) compound chaetae, midbody. (D) ventral simple chaeta. (E) acicula. Scale A: 0.064 mm, B–E: 20 µm.



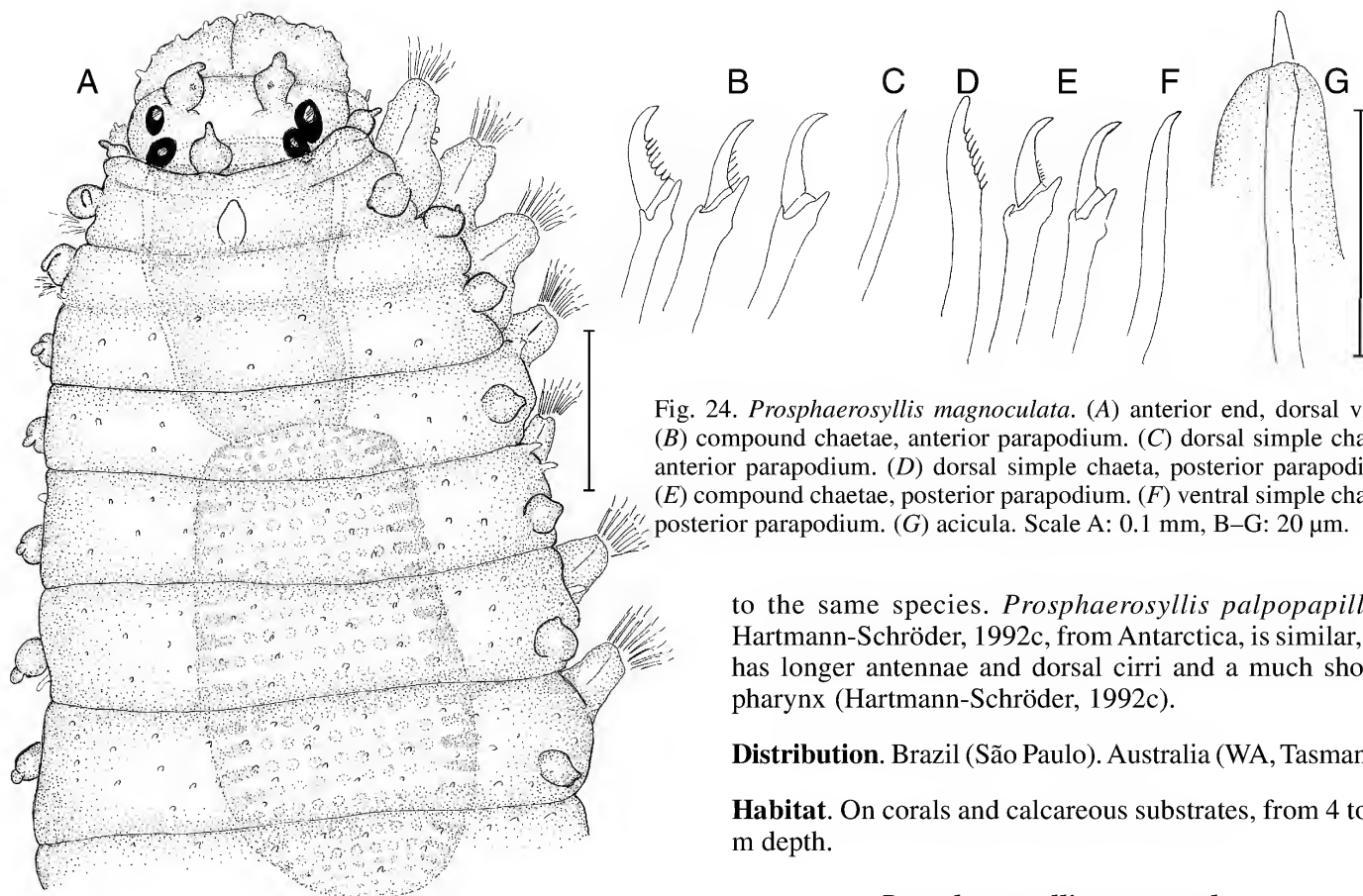


Fig. 24. *Prosphaerosyllis magnoculata*. (A) anterior end, dorsal view. (B) compound chaetae, anterior parapodium. (C) dorsal simple chaeta, anterior parapodium. (D) dorsal simple chaeta, posterior parapodium. (E) compound chaetae, posterior parapodium. (F) ventral simple chaeta, posterior parapodium. (G) acicula. Scale A: 0.1 mm, B–G: 20 µm.

Description. Body short, relatively slender, dorsal and ventral surfaces with small, scattered papillae, 3 mm long, 0.15 mm wide, 33 chaetigers. Prostomium rectangular to oval; 2 pairs of small eyes in rectangular arrangement close to each other on each side, and 2 anterior, small ocular eyespots. Antennae short, with bulbous bases and short, rounded tips (Fig. 23A); lateral antennae inserted on anterior margin of prostomium, just behind eyespots; median antenna inserted on posterior margin. Palps completely fused to each other, with a dorsal furrow, shorter than prostomium, densely covered by short papillae (Fig. 23A). Peristomium large, covering dorsally posterior part of prostomium; tentacular cirri similar to antennae but even smaller (Fig. 23A). Dorsal cirri on all segments, small, mammiform, with an oval subdistal part and short, button-like, retractile tip (Fig. 23A). Parapodia conical, short, provided with few, small papillae. Anterior parapodia each with about 6–7 compound chaetae, strongly heterogomph, smooth shafts, with short, unidentate, slightly hooked blades, provided with short marginal spines; numbers of compound chaetae decreasing posteriorly to 2–4; from proventricular segments all compound chaetae with smooth, hooked blades (Fig. 23C), 9–6 µm long. Dorsal simple chaetae from chaetiger 1, unidentate, with few, short subdistal spines (Fig. 23B). Ventral simple chaetae on posterior parapodia, similar to dorsal simple chaeta, smooth (Fig. 23D). Acicula solitary, acuminate (Fig. 23E). Pharynx long, everted on both specimens, through about 5 segments; pharyngeal tooth small, located on anterior 1/3; proventricle long and large, through 3–4 segments, with about 35–40 muscle cell rows.

Remarks. The Australian specimens of this species agree well with the original description, although the long distance between Brazil and Australia, so I assume that they belong

to the same species. *Prosphaerosyllis palpopapillata* Hartmann-Schröder, 1992c, from Antarctica, is similar, but has longer antennae and dorsal cirri and a much shorter pharynx (Hartmann-Schröder, 1992c).

Distribution. Brazil (São Paulo). Australia (WA, Tasmania).

Habitat. On corals and calcareous substrates, from 4 to 30 m depth.

***Prosphaerosyllis magnoculata*
(Hartmann-Schröder, 1986) n.comb.**

Figs. 24A–G, 25A–C

Sphaerosyllis magnoculata Hartmann-Schröder, 1986: 45, figs. 29–31.

Not *Sphaerosyllis magnoculata* Hartmann-Schröder, 1989: 29, fig. 37.

Material examined. AUSTRALIA: QUEENSLAND. 1 specimen, AM W202655, Triangular Islets, Shoalwater Bay, 22°21'S 150°31'E, J.A. Lewis & J.R. Forsyth, 1981. NEW SOUTH WALES. 1 specimen, AM W22589, Cararma Inlet, Jervis Bay, 35°00'S 150°46.5'E, unvegetated, sandy to muddy sediment, intertidal, 0 m, L. Howitt, Dec 1988. 1 specimen, AM W22625, Cararma Inlet, Jervis Bay, 35°00'S 150°46.5'E, *Zostera capricorni*, L. Howitt, Mar 1989. 1 specimen, AM W23141, Honeymoon Bay, Jervis Bay, 35°03.8'S 150°45.4'E, unvegetated sediment, 20 m, P.A. Hutchings & party, 21 Feb 1991. 1 specimen, AM W23484, Honeymoon Bay, Jervis Bay, 35°03.8'S 150°45.4'E, unvegetated sediment, 20 m, P.A. Hutchings & party, 20 Feb 1989. 1 specimen, AM W23564, Weeney Bay, Botany Bay, 34°01.3'S 151°09.7'E, mud, 1 m, A. Roach & A. Jones, 30 Mar 1995. 1 specimen, AM W26532, 100 m north west of Split Solitary Island, 30°14.0'S 153°10.8'E, mixed red algae, 15 m, S.J. Keable, 7 Mar 1992. 1 specimen, AM W26704, South Ledge, Cook Island, 28°11.65'S 153°34.63'E, sand and shell grit, 15 m, K.B. Attwood, 09 Jun 1993. VICTORIA. 3 specimens, MV F62801, Bass Strait, 1 km E off Woodside Beach, 38°33'S 146°57'E, sand, 15 m depth, 9 Mar 1989. 51 specimens, MV F62262, Same locality, 13.3 km of eastern edge of Lake Tyres, 37°51.74'S 148°14.77'E, sand & shell, 37 m depth, 25 Sept 1990. TASMANIA. 2 specimens, AM W27674, north end of beach, Parsons Cove, Freycinet National Park, 42°08.6'S 148°16.9'E, coarse gravel, intertidal, 0 m, N.W. Riser, 24 Jan 1986. WESTERN AUSTRALIA. 1 specimen, AM W26702, off end of South Mole, Arthur Head, Fremantle, 32°03'S 115°44'E, orange tunicates, 6 m, J.K. Lowry, 25 Dec 1983.

Description. Body small, 2–3 mm long, 0.24 mm wide, 20–30 chaetigers, broad anteriorly, provided with scattered, small dorsal and ventral papillae (Figs. 24A, 25A–C). Prostomium rectangular to oval, wider than long; 4 large eyes in trapezoidal arrangement and 2 anterior eyespots.

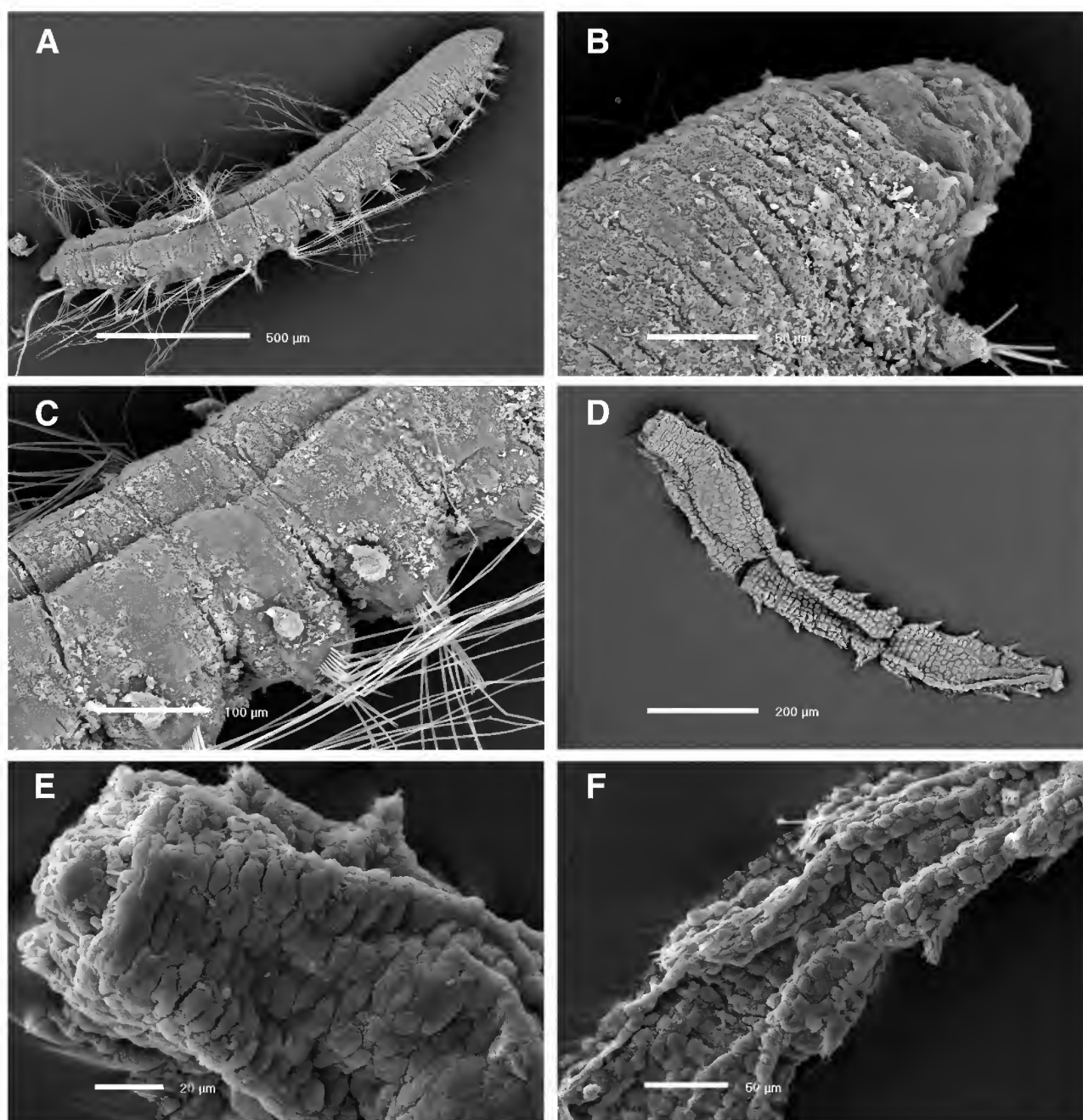


Fig. 25. SEM of *Prosphaerosyllis magnoculata*. (A) dorsal view of a mature male with long natatory notochaetae. (B) prostomium, peristomium and chaetiger 1, laterodorsal view (antennae missing). (C) midbody segments, laterodorsal view. SEM of *Prosphaerosyllis multipapillata*. (D) dorsal view. (E) anterior end, dorsal view. (F) ventral view, midbody.

Antennae small, pyriform, all similar in shape and size (Fig. 24A), with bulbous bases and short tip; lateral antennae inserted in front of anterior eyes, near eyespots, median antenna inserted between posterior eyes. Palps large, short, totally fused all along their length, with some papillae (Figs. 24A, 25B). Peristomium covering dorsally posterior margin of prostomium; tentacular cirri similar in shape to antennae, but smaller (Fig. 24A). Dorsal cirri on all segments, similar throughout, similar to antennae (Figs. 24A, 25A,C). Parapodial lobes relatively short, conical, with some short papillae. Compound chaetae heterogomph, with smooth shafts, and unidentate, short blades, smooth or provided with short marginal spines on dorsal chaetae (Fig. 24B,E). Anterior parapodia each with 7–8 compound chaetae, diminishing to 3–4 on posterior parapodia. All blades similar in size, 8–9 µm on anterior parapodia, slightly shorter on posterior parapodia. Dorsal simple chaetae from anterior segments, usually from chaetiger 1, unidentate, with few, short

subdistal spines (Fig. 24D), slender and smooth anteriorly (Fig. 24C). Ventral simple chaetae on posterior parapodia, sigmoid, smooth (Fig. 24F). Acicula solitary, straight with a subdistal small enlargement, protruding only slightly from parapodial lobes (Fig. 24G). Pharynx wide, through 4 segments; pharyngeal tooth oval, located near anterior $\frac{1}{3}$ of pharynx (Fig. 23A). Proventricle similar in length and width to pharynx, through 3 segments, with 22 muscle cell rows.

Remarks. This species resembles *P. sexpapillata*, described above, but differs in having scattered dorsal papillae and all dorsal cirri similar, not elongate on posterior parapodia and in the shape of the aciculae.

Distribution. Australia (Western Australia, South Australia, Victoria, Tasmania, New South Wales).

Habitat. Intertidal to about 37 m depth, on all kind of substrates: algae, sand, mud, seagrasses, tunicates.

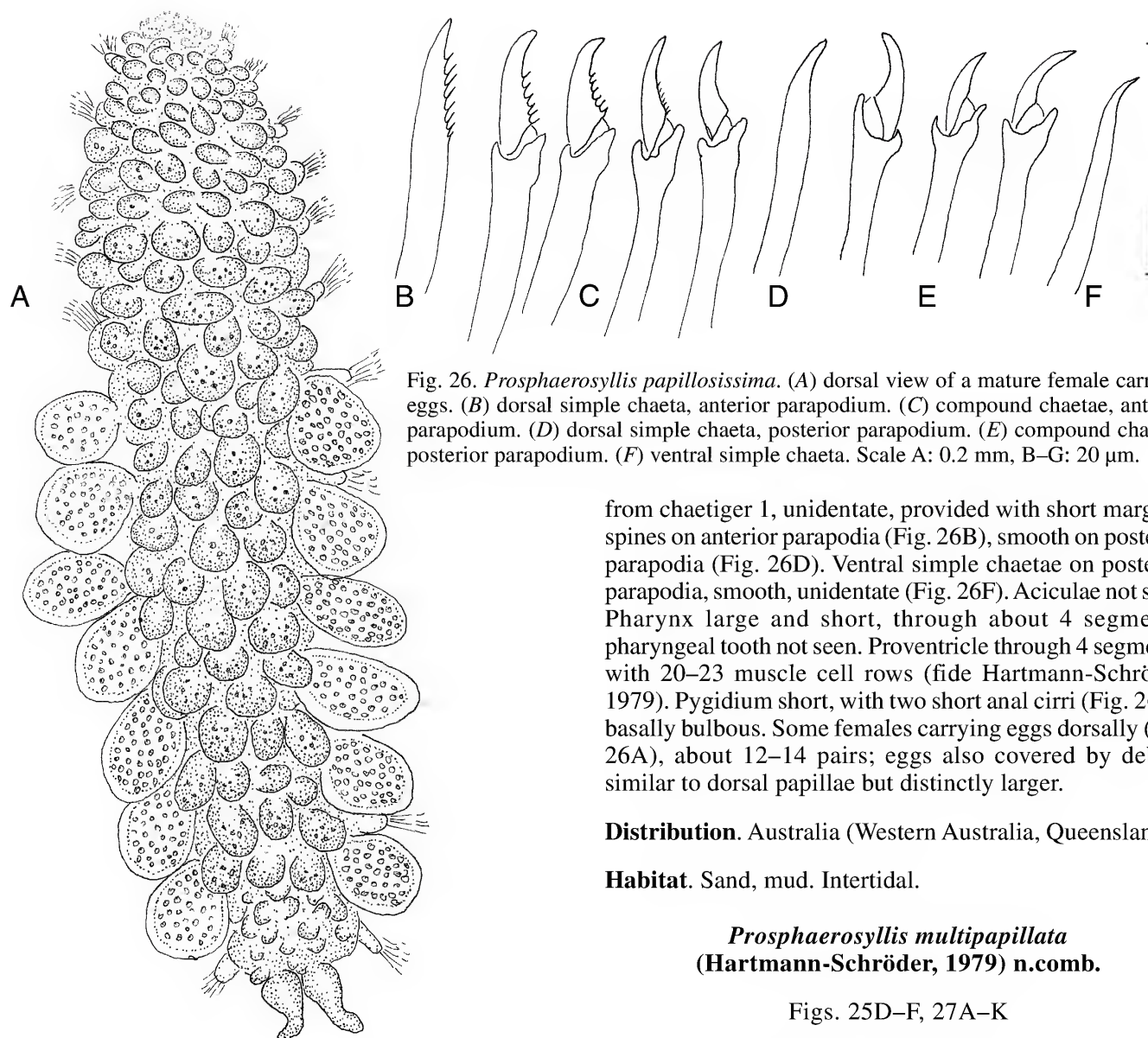


Fig. 26. *Prosphaerosyllis papillosissima*. (A) dorsal view of a mature female carrying eggs. (B) dorsal simple chaeta, anterior parapodium. (C) compound chaetae, anterior parapodium. (D) dorsal simple chaeta, posterior parapodium. (E) compound chaetae, posterior parapodium. (F) ventral simple chaeta. Scale A: 0.2 mm, B–G: 20 μ m.

***Prosphaerosyllis papillosissima*
(Hartmann-Schröder, 1979) n.comb.**

Fig. 26A–F

Sphaerosyllis papillosissima Hartmann-Schröder, 1979: 108, figs. 159–162; 1981: 37; 1982: 72.

Material examined. AUSTRALIA: QUEENSLAND. 16 specimens, AM W26931, Hinchinbrook Channel, 18°20'S 146°4'E, tidal flats (mud & sand), S. Dittmann, 18 Nov 1988.

Description. Body minute, up to 1.4 mm long, 0.2 mm wide, 14–16 chaetigers, covered by debris, opaque; papillae large, forming vesicles of different sizes, covering dorsum (Fig. 26A) and ventrum, ventral papillae slightly shorter than dorsal papillae, but large in relation to size of body. Prostomium, palps and tentacular cirri covered by anterior segments, not visible, only antennae visible on some specimens, short, papilliform, distally truncated. Dorsal cirri similar to antennae, difficult to see. Apparently, without eyes. Anterior parapodia each with 4–5 compound chaetae, provided with short, falciform, unidentate blades, smooth or provided with short marginal spines (Fig. 26C), about 11–9 μ m long. Posterior parapodia each with 3 compound chaetae, similar to those of anterior parapodia (Fig. 26E), with slightly shorter, smooth blades. Dorsal simple chaetae

from chaetiger 1, unidentate, provided with short marginal spines on anterior parapodia (Fig. 26B), smooth on posterior parapodia (Fig. 26D). Ventral simple chaetae on posterior parapodia, smooth, unidentate (Fig. 26F). Aciculae not seen. Pharynx large and short, through about 4 segments; pharyngeal tooth not seen. Proventricle through 4 segments, with 20–23 muscle cell rows (fide Hartmann-Schröder, 1979). Pygidium short, with two short anal cirri (Fig. 26A), basally bulbous. Some females carrying eggs dorsally (Fig. 26A), about 12–14 pairs; eggs also covered by debris, similar to dorsal papillae but distinctly larger.

Distribution. Australia (Western Australia, Queensland).

Habitat. Sand, mud. Intertidal.

***Prosphaerosyllis multipapillata*
(Hartmann-Schröder, 1979) n.comb.**

Figs. 25D–F, 27A–K

Sphaerosyllis multipapillata Hartmann-Schröder, 1979: 107, figs. 154–158; 1982: 72; 1983: 135.

Material examined. AUSTRALIA: NEW SOUTH WALES. 6 specimens, AM W22991, Bass Point, 34°36'S 150°54'E, 50 m, The Ecology Lab, for Ready Mixed Industries, 1 Feb 1990. 1 specimen, AM W24374, east of Long Reef, 33°43.63'S 151°19.46'E, sand, 30 m, Fisheries Research Institute, 24 July 1989. VICTORIA. 9 specimens, MV F62673, Eastern Bass Strait, 15 km of eastern edge of Lake Tyers, 50°8'S 148°15.58'E, sand and shell, 25 m depth, 25 Sept 1990. 14 specimens, MV F62205, Eastern Bass Strait, 10.9 km W of Pt. Ricardo, 37°48.96'S 140°30.41'E, medium sand, 18 m depth, Feb 1991.

Description. Body small, broad, 4.2 mm long, 0.45 mm wide, 28 chaetigers, densely covered by numerous, rounded papillae, all similar (Figs. 25D,E, 27A–C), also on ventral surface (Fig. 25F); some specimens contracted on anterior half of body (Figs. 25E, 27A,C), forming a voluminous region, distinctly broader than posterior half (Fig. 25D). Prostomium rectangular, wider than long, with 4 eyes in rectangular arrangement, and 2 anterior, minute eyespots. Antennae small, papilliform, distally truncated (Fig. 27B,C); lateral antennae inserted in front of anterior eyes, median antenna inserted between anterior pair of eyes. Palps similar in length to prostomium, totally fused all along their length, with scattered papillae (Fig. 27B,C). Peristomium covering partially (Fig. 27B,C) or totally (Fig. 27A) prostomium and palps; some specimens with prostomium and palps contracted to level of chaetiger 1 (Fig. 27A); tentacular cirri

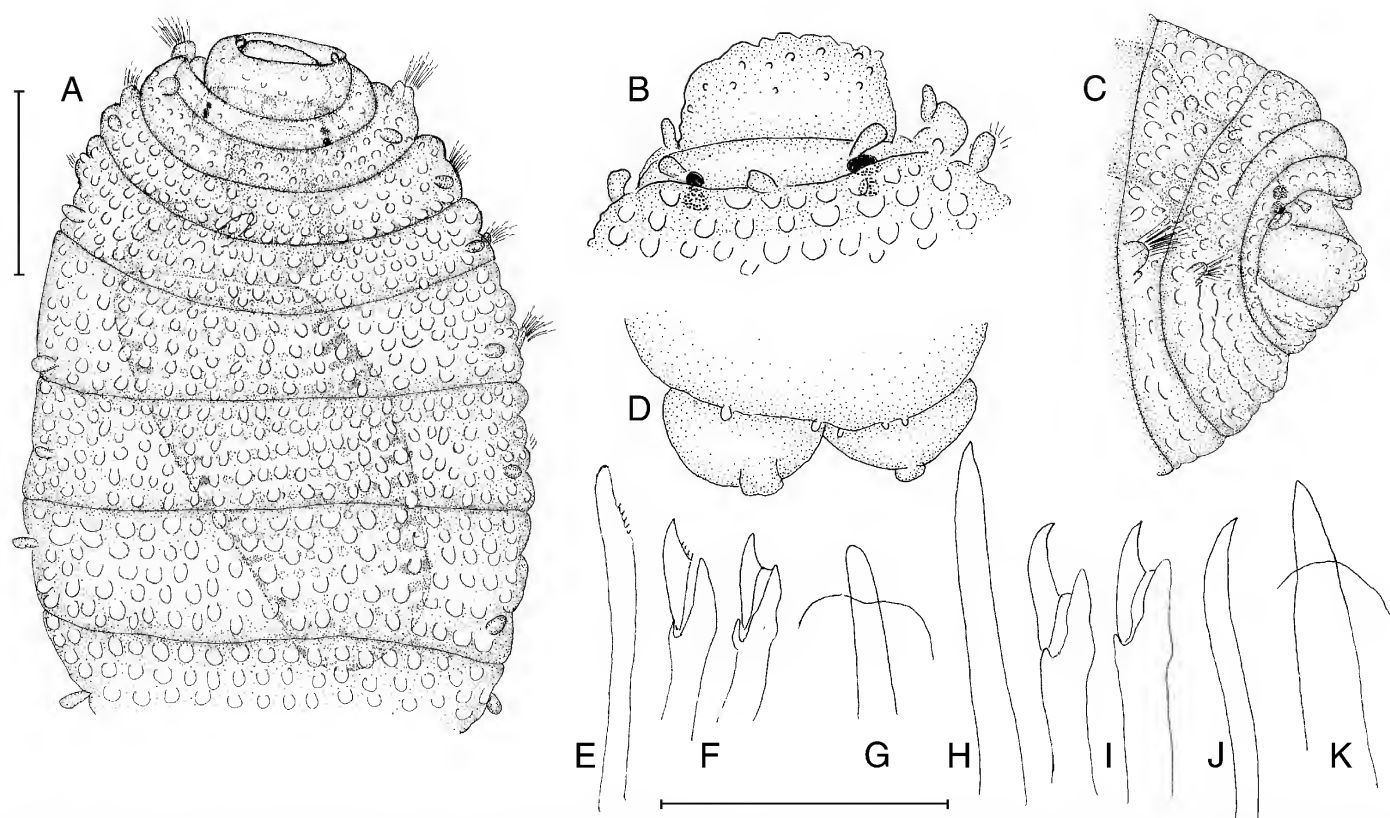


Fig. 27. *Prosphaerosyllis multipapillata*. (A) anterior end, dorsal view. (B) prostomium and palps. (C) anterior end, lateral view. (D) pygidium. (E) dorsal simple chaeta, anterior parapodium. (F) compound chaetae, anterior parapodium. (G) acicula, anterior parapodium. (H) dorsal simple chaeta, posterior parapodium. (I) compound chaetae, posterior parapodium. (J) ventral simple chaeta. (K) acicula, posterior parapodium. Scale A,C: 0.064 mm, B,D: 0.1 mm, E–K: 20 µm.

similar to antennae, even shorter (Fig. 27A–C). Dorsal cirri on all segments, papilliform, similar to dorsal papillae (Fig. 27A–C). Parapodia short, conical. Compound chaetae strongly heterogomph, shafts smooth, with short blades, smooth (Fig. 27I) or provided with short marginal spines (Fig. 27F) on anterior parapodia; parapodia each with about 4–6 compound chaetae; blades about 8–6 µm on anterior parapodia, 9 µm on midbody. Dorsal simple chaetae relatively thick, provided with few, short marginal spines, usually from chaetiger 1 (Fig. 27E), smooth and almost straight on posterior parapodia (Fig. 27H). Ventral simple chaetae on posterior parapodia, sigmoid, smooth (Fig. 27J). Acicula solitary, straight, protruding out from parapodial lobes (Fig. 27G), slightly larger on posterior parapodia (Fig. 27K). Pharynx wide, usually contracted (Fig. 27A); pharyngeal tooth oval, located on middle of pharynx. Proventricle long, large, through 2–4 segments, with 25 muscle cell rows. Pygidium small, with two large and short anal cirri, with a semispherical cirrophore and short, small cirrostyle (Fig. 27D).

Remarks. *Prosphaerosyllis adela* San Martín, 1984b, from the Mediterranean Sea, appears to be similar, because the strong contraction of the prostomium inside the peristomium and having the anterior part of body broad; the Mediterranean species, however, has a dorsum with few, small papillae, being long, digitiform on ventral surface (San Martín, 1984b, 2003).

Distribution. Australia (Western Australia, Victoria, New South Wales).

Habitat. Fine to coarse sand and gravel, intertidal to 50 m depth.

Prosphaerosyllis battiri n.sp.

Figs. 28A–H, 29A–F

Material examined. AUSTRALIA: WESTERN AUSTRALIA. HOLOTYPE: AM W26802, outer Ningaloo Reef, off Ned's Camp, Cape Range National Park, 21°59.5'S 113°54.5'E, airlift from living *Porites* sp., 2 m, R.T. Springthorpe & J.K. Lowry, 1 Jan 1984. PARATYPES: 2 specimens (1 specimen on SEM stub), AM W27667, inshore reef, Ned's Camp, Cape Range National Park, 21°59'S 113°55'E, very fine sediment and sand from patches in reef, 1 m, H.E. Stoddart, 2 Jan 1984.

Description. Body short, holotype mature male with natatory chaetae from chaetiger 8 to 23, 2.72 mm long, 0.27 mm wide, 28 chaetigers. Prostomium oval to pentagonal, slightly larger than long, contracted on anterior segments but not covered by them (Figs. 27A, 28B); 4 large eyes in trapezoidal arrangement and 2 anterior eyespots. Antennae all similar, small, mamilliform; median antenna inserted between posterior eyes, lateral antennae inserted in front of anterior eyes, slightly posteriorly to eyespots (Fig. 28A). Palps short, fused all along their length except for a terminal notch, provided with distinct papillae (Fig. 28A). Peristomium small, short, indistinct, covering posterior margin of prostomium (Figs. 28A, 29B); tentacular cirri similar to antennae but smaller (Figs. 28A, 29B), similar to papillae. Dorsum and ventrum covered by large, round papillae, forming 3–4 irregular transverse rows, giving a rough appearance (Fig. 29A), especially on anterior half of body (Figs. 28A, 29B), papillae less numerous on posterior half of body (Figs. 28B, 29D). Dorsal cirri on all parapodia, short, mamilliform (Fig. 29C) to lemon-shaped on anterior parapodia (Figs. 28A, 29B), longer and larger on posterior half of body, dilated basally, provided with a distinct, retractile cirrostyle (Figs. 28B, 29C). Compound chaetae

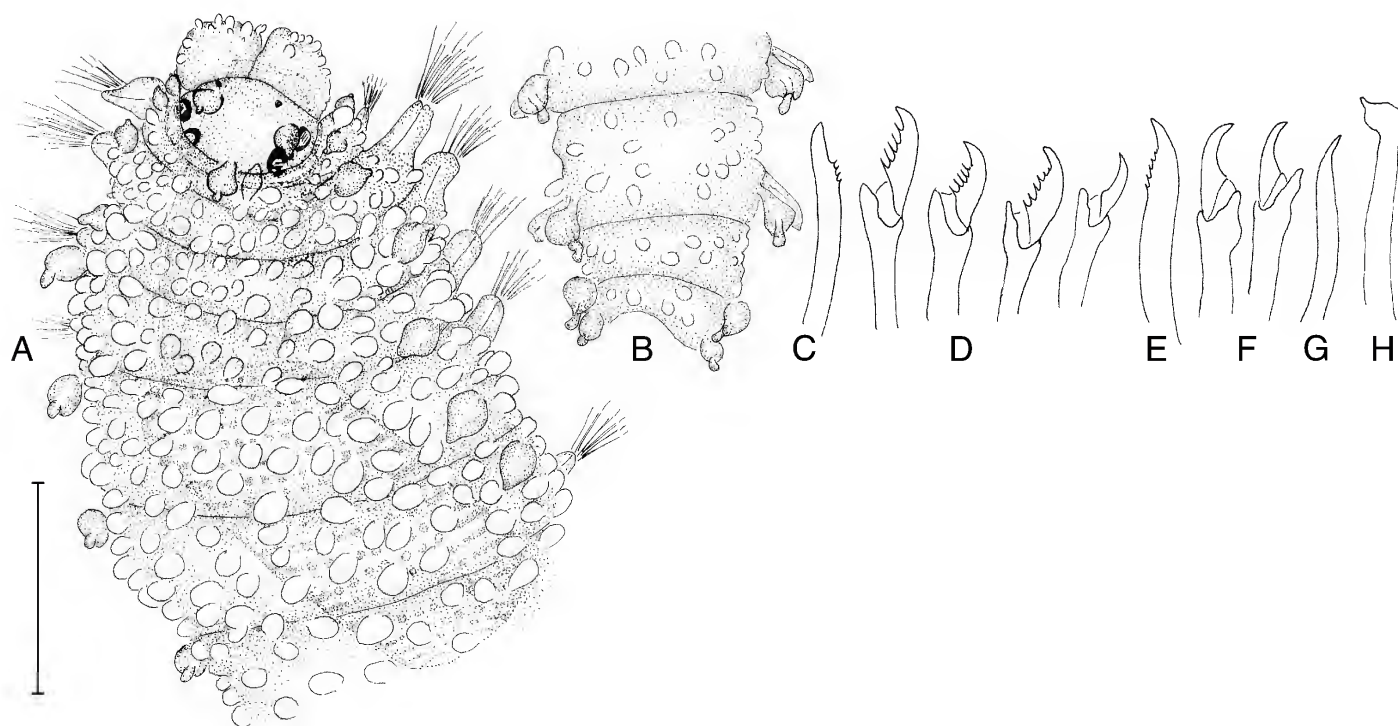


Fig. 28. *Prosphaerosyllis battiri* n.sp. (A) anterior end, dorsal view (Holotype). (B) posterior end, dorsal view (Paratype). (C) dorsal simple chaeta, anterior parapodium. (D) compound chaetae, anterior parapodium. (E) dorsal simple chaeta, posterior parapodium. (F) compound chaetae, posterior parapodium. (G) ventral simple chaeta. (H) acicula. Scale A,B: 1.6 mm, C-H: 20 µm.

provided with short, falcate, unidentate blades, with short marginal spines of anterior parapodia (Figs. 28D, 29E,F), smooth on remaining parapodia (Fig. 28F); anterior parapodia each with 5 compound chaetae, blades 6–4 µm long, posterior parapodia each with 4 compound chaetae, blades all about 4.5 µm long. Dorsal simple chaetae from chaetiger 1, unidentate, nearly smooth on margin (Fig. 28C,E). Ventral simple chaetae on posterior parapodia, sigmoid, smooth, unidentate (Fig. 28G). Acicula solitary, slender, acuminate (Fig. 28H). Pharynx through about 4–5 segments; pharyngeal tooth large, rhomboidal, located in anterior half pf pharynx (Fig. 28A). Proventricle through 3 segments, with about 26 muscle cell rows.

Remarks. *Prosphaerosyllis battiri* n.sp. is characterized by having palps not totally fused, prostomium not retracted on peristomium or only slightly retracted, the shape of dorsal cirri and the arrangement of papillae, which are numerous anteriorly and less numerous on posterior segments. It appears to resemble *Prosphaerosyllis semiverrucosa* Ehlers, 1913, but the arrangement of dorsal papillae is reversed, being more or less smooth on anterior segments and rough on posterior half of body (Ehlers, 1913; Day, 1967); I have examined one posterior piece of one specimen of *S. semiverrucosa* (ZHM P-14615) and it agrees perfectly with Ehlers' and Day's descriptions, with numerous dorsal papillae.

Distribution. Australia (Western Australia).

Habitat. On corals and sediments in shallow water.

Etymology. From the Aboriginal name *battiri*, meaning rough.

Genus *Erinaceusyllis* n.gen.

Diagnosis. Body small to minute, more or less densely covered by papillae, usually small, short, scarce, sometimes also distributed on cirri and parapodia. Prostomium with 3 antennae, 4 eyes and 2 anterior eyespots. Peristomium usually large, covering posterior margin of prostomium, sometimes forming 2 dorsolateral wings covering nuchal organs; single pair of tentacular cirri. Dorsal cirri on chaetiger 2 absent or present, depending upon the species, usually absent. Antennae, tentacular cirri and dorsal cirri spindle-shaped to pyriform, with slightly bulbous bases and short to moderately long tip. A pair of anal cirri similar to dorsal cirri, usually longer. Compound chaetae heterogomph, with blades short or long, sometimes long and slender, bidentate, bidentate and unidentate, or unidentate. Pharyngeal tooth small, conical to rhomboidal, located near anterior margin, sometimes near middle of pharynx; pharynx usually without papillae around opening, but present on larger species. Proventricle long and wide, barrel-shaped, with numerous, slender muscle cell rows (15–22). Mature males with natatory chaetae; females brooding eggs dorsally, by means of capillary notochaetae.

Type species. *Sphaerosyllis erinaceus* Claparède, 1863, herein designated.

Remarks. This new genus consists of several species previously described under *Sphaerosyllis* and several described as sub-species of *Sphaerosyllis erinaceus*, differing by the compound chaetae; these differences are sufficient to consider all of them as different species. *Erinaceusyllis* n.gen. is obviously similar to *Sphaerosyllis*.

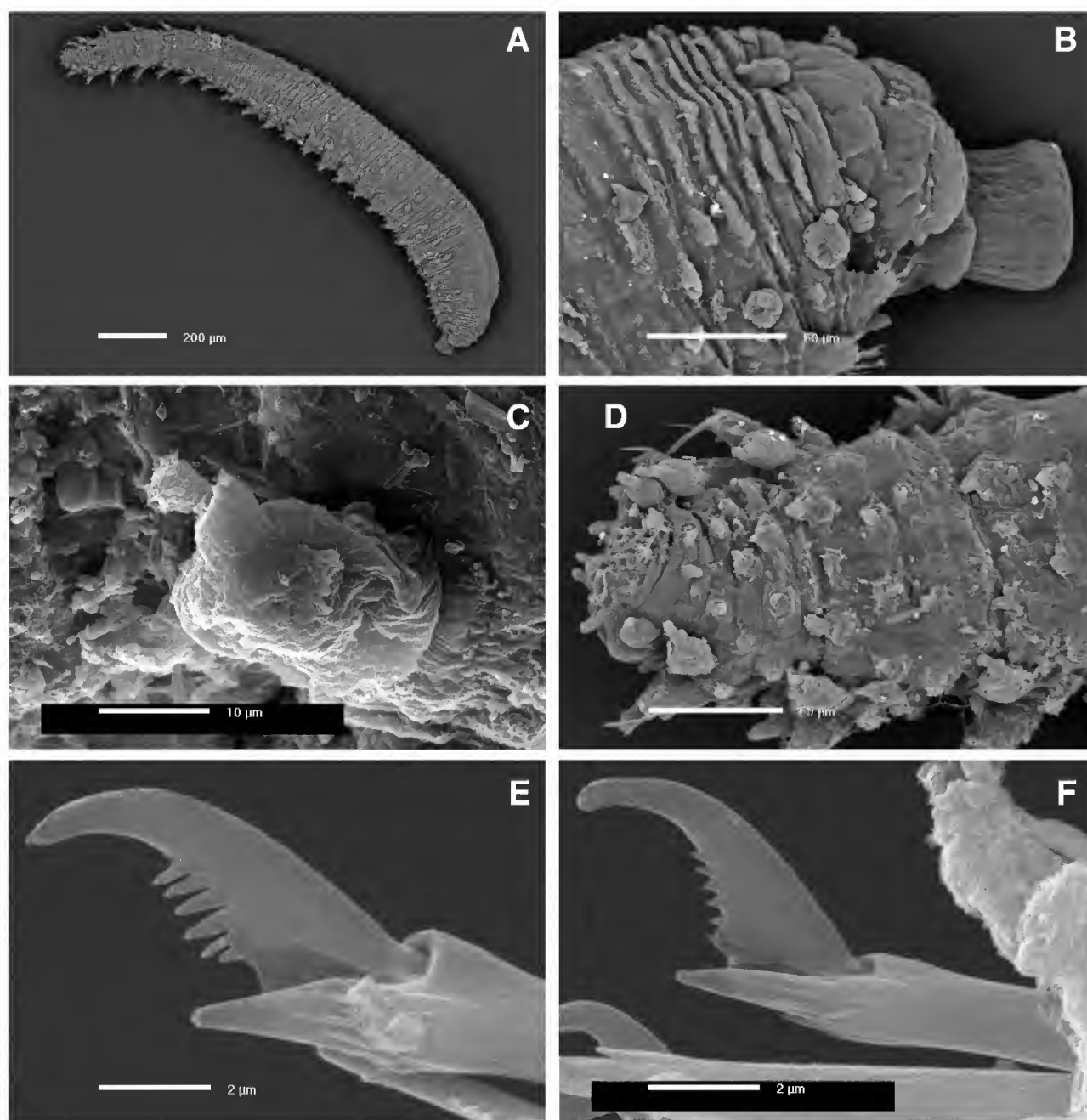


Fig. 29. SEM of *Prosphaerosyllis battiri* n.sp. (A) complete paratype, dorsolateral view. (B) prostomium, peristomium and chaetigers 1 and 2, dorsolateral view. (C) dorsal cirrus, midbody. (D) posterior end, dorsal view. (E, F) compound chaetae, anterior parapodium.

Species of *Sphaerosyllis*, however, always have papillae on the pharynx opening, the pharyngeal tooth is conical, always located on the anterior margin of pharynx or very near, usually with a short proventricle provided with few, a large muscle cell rows, large posterior acicula distally bent at a right angle, blades of compound chaetae always short and unidentate, and brood developing ventrally embryos and juveniles, without capillary notochaetae on the females, only on males. *Sphaerosyllis horrockensis*, *Sphaerosyllis belizensis*, and *S. centroamericana*, are herein transferred to *Erinaceusyllis* n.gen. because their characters agree with the diagnosis given above and they are different to that of *Sphaerosyllis* as given below. *Prosphaerosyllis* is close to *Erinaceusyllis* n.gen., but the pharyngeal tooth is

rhomboidal to oval and located usually near middle of pharynx, antennae are always short, tentacular and dorsal cirri have a bulbous cirrophore and retractile cirrostyle, and the papillae are more numerous, usually of different sizes.

The genus *Cicese* Díaz-Castañeda & San Martín, 2001 is identical to *Erinaceusyllis* but has two pairs of tentacular cirri instead of a single pair (Díaz-Castañeda & San Martín, 2001).

The type species of this genus is *Sphaerosyllis erinaceus* Claparède, 1863; the original description, however, is incomplete (Claparède, 1863); the species has been reported worldwide but probably these records represent a complex of different species, that need to be re-examined.

Key to species of *Erinaceusyllis* recorded from Australia

- 1 Dorsal cirri present on chaetiger 2 *E. horrockensis*
 — Dorsal cirri absent on chaetiger 2 2
- 2 Blades of compound chaetae all bidentate *E. bidentata*
 — All or some blades unidentate 3
- 3 Longer blades of compound chaetae bidentate, remaining blades unidentate *E. belizensis*
 — All blades unidentate 4
- 4 At least some compound chaetae with long, slender blades 5
 — All blades relatively short, falcate 7
- 5 Median antenna located close to lateral antennae, on anterior margin of prostomium, similar in size to lateral ones. Anterior eyes in line with eyespots *E. centroamericana*
 — Median antenna longer than lateral ones, inserted posteriorly. Anterior eyes near posterior ones, posterior to eyespots 6
- 6 Long and mid-sized blades of each parapodium provided basally with long, erect pointed spines *E. serratosetosa*
 — Long and mid-sized blades with short, fine marginal spines. Blades slender, sabre-shaped *E. ettiennei* n.sp.
- 7 Dorsal cirri each provided with 1–2 distinct, long, mushroom-shaped papillae *E. cirripapillata* n.sp.
 — Dorsal cirri without this kind of papillae 8
- 8 Pharyngeal tooth located in front of middle of pharynx *E. opisthodentata*
 — Pharyngeal tooth located near anterior rim 9
- 9 Blades of compound chaetae of each parapodium all similar in size, those of dorsal chaetae with long marginal spines and remaining smooth or with short marginal spines *E. hartmannschroederiae* n.sp.
 — Compound chaetae with dorsoventral gradation in length of blades, all of which are provided with short marginal spines *E. kathrynae* n.sp.

Erinaceusyllis horrockensis
(Hartmann-Schröder, 1981) n.comb.

Fig. 30A–I

Brania horrockensis Hartmann-Schröder, 1981: 35, figs. 68–72.
Sphaerosyllis horrockensis.—Hartmann-Schröder, 1982: 71; 1983: 134; 1984: 23; 1985: 70; 1986: 43; 1987: 41; 1989: 28.

Material examined. AUSTRALIA: NEW SOUTH WALES. 1 specimen, AM W26436, 100 m north west of Split Solitary Island, 30°14.0'S 153°10.8'E, mixed red algae, 15 m, S.J. Keable, 7 Mar 1992. 1 specimen, AM W26440, 100 m north west of Split Solitary Island, 30°14.0'S 153°10.8'E, mixed red algae, 15 m, S.J. Keable, 7 Mar 1992. 1 specimen, AM W26441, Richmond River, near shore Ballina, old wharf between Cherry & Martin Sts, 28°52.5'S 153°33.6'E, drift algae, 6 m, S.J. Keable, 5 Mar 1992. 4 specimens, AM W26442, Halfway Reef, 200 m south of Sullivan Reef, Ulladulla, 35°21.42'S 150°29.31'E, airlift over wall of sponges, bryozoa & hydrozoa, 15 m, K. Attwood *et al.*, 3 May 1997. 3 specimens, AM W26533, southwest side of South Solitary Island, 30°12.0'S 153°16.0'E, coral rubble, 18 m, R.T. Springthorpe, 24 Jun 1992. 2 specimens, AM W26544, 100 m north west of Split Solitary Island, 30°14.0'S 153°10.8'E, encrusting algae & ascidians, 16 m, E.L. Albertson, 7 Mar 1992. 7 specimens, AM W26610, Grotto Point, Balmoral Beach, Port Jackson, 33°49'S 151°15'E, algae, 4 m, P. Colman, 18 July 1983. 3 specimens, AM W26612, north east corner of Clark Island, 33°51.85'S 151°14.47'E, encrustation on outside of bottle, 5 m, P.A. Hutchings, 17 Apr 1996. 1 specimen, AM W26644, Bottle and Glass Rocks, Port Jackson, 33°50.9'S 151°16.2'E, airlift, 12 m, G. Clark, 11

Dec 1989. 2 specimens, AM W26705, 100 m north west of Julian Rocks, Byron Bay, 28°36.8'S 153°37.8'E, shell and gravel, 15 m, E.L. Albertson, R.T. Springthorpe & G.D.F. Wilson, 3 Mar 1992. VICTORIA. 6 specimens, MV F62701, Eastern Bass Strait, 11.7 km W of Pt. Ricardo, 37°49.89'S 148°30.13'E, coarse sand, 27 m depth, 4 June 1991. TASMANIA. 3 specimens, AM W27671, north end of beach, Parsons Cove, Freycinet National Park, 42°08.6'S 148°16.9'E, clean gravelly sand, intertidal, 0 m, N.W. Riser, 24 Jan 1986. SOUTH AUSTRALIA. 4 specimens, AM W26746, Billy Lights Point, Port Lincoln, 34°45'S 135°53'E, stone washings from sheltered intertidal rocks, 0 m, I. Loch, 15 Feb 1985. 1 specimen, AM W26747, Elliston Reef, 33°39'S 134°53'E, algae from reef flat at low tide, P.A. Hutchings, 11 Mar 1979. WESTERN AUSTRALIA. 1 specimen, AM W26671, east side of West Wallabi Island, 28°27.9'S 113°40.9'E, in *Posidonia australis* root mat, plus epifauna, 2 m, P.A. Hutchings, 26 May 1994.

Description. Body small to minute, 2.7 mm long, 0.15 mm wide, 28 chaetigers, covered with small, scattered papillae (Fig. 30A). Prostomium oval, wider than long; 4 large eyes in trapezoidal arrangement, nearly in line, and 2 anterior eyespots; antennae spindle-shaped, basally bulbous; median antenna similar to combined length of prostomium and palps, inserted slightly anteriorly to anterior eyes; lateral antennae shorter than median antenna, inserted slightly anteriorly to median antenna (Fig. 30A,B). Palps shorter than prostomium, fused along their length. Peristomium similar in length to following segments; tentacular cirri

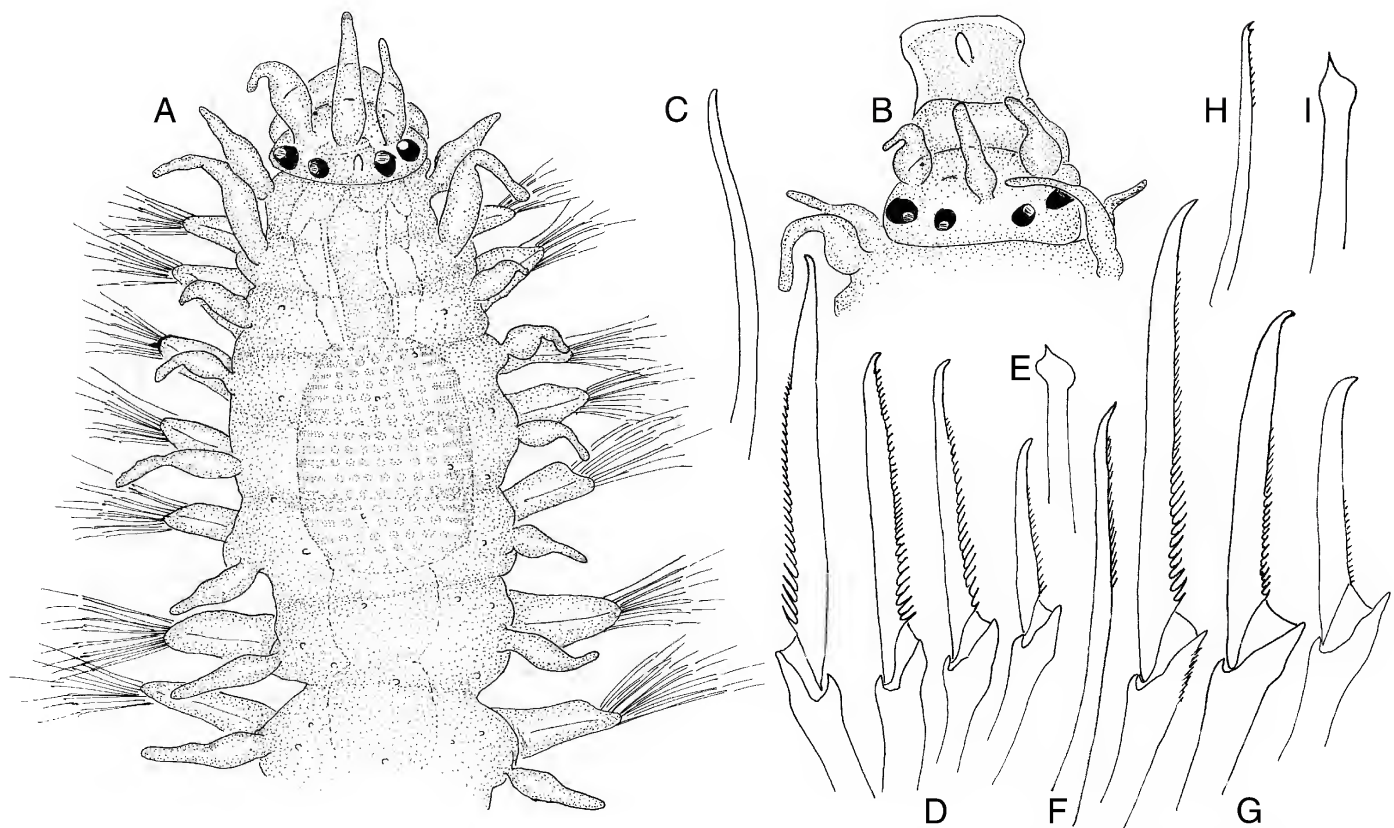


Fig. 30. *Erinaceusyllis horrockensis*. (A) anterior end, dorsal view. (B) prostomium and anterior rim of everted pharynx. (C) dorsal simple chaeta, anterior parapodium. (D) compound chaetae, anterior parapodium. (E) acicula, anterior parapodium. (F) dorsal simple chaeta, posterior parapodium. (G) compound chaetae, posterior parapodium. (H) ventral simple chaeta. (I) acicula, posterior parapodium. Scale A,B: 0.1 mm, C–I: 20 μ m.

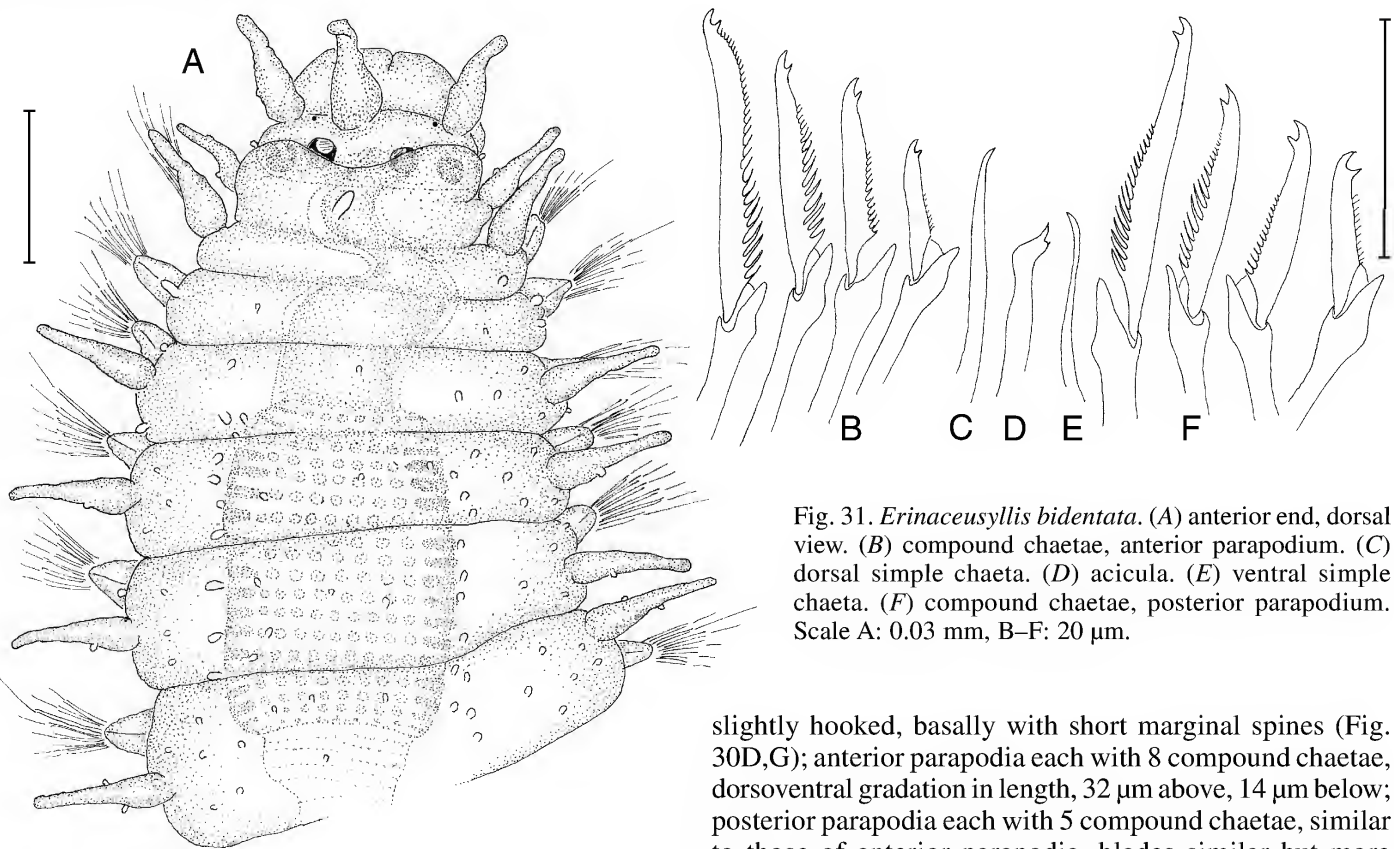


Fig. 31. *Erinaceusyllis bidentata*. (A) anterior end, dorsal view. (B) compound chaetae, anterior parapodium. (C) dorsal simple chaeta. (D) acicula. (E) ventral simple chaeta. (F) compound chaetae, posterior parapodium. Scale A: 0.03 mm, B–F: 20 μ m.

similar to lateral antennae. Dorsal cirri on all segments; dorsal cirri of chaetiger 1 longer than antennae, dorsal cirri of chaetiger 2 much shorter, basally inflated, sphaerical, progressively longer on midbody, with bulbous bases and short tip (Fig. 30A). Compound chaetae heterogomph, with smooth shafts and blades elongate, unidentate, distally

slightly hooked, basally with short marginal spines (Fig. 30D,G); anterior parapodia each with 8 compound chaetae, dorsoventral gradation in length, 32 μ m above, 14 μ m below; posterior parapodia each with 5 compound chaetae, similar to those of anterior parapodia, blades similar but more elongate, about 36 μ m above 20 μ m below. Dorsal simple chaetae on anterior parapodia, usually from chaetiger 1, distally entire, smooth (Fig. 30C) or provided with short marginal spines (Fig. 30F). Ventral simple chaetae slender, smooth, indistinctly bidentate (Fig. 30H), on posterior parapodia. Acicula solitary, acuminate (Fig. 30C,I). Pharynx

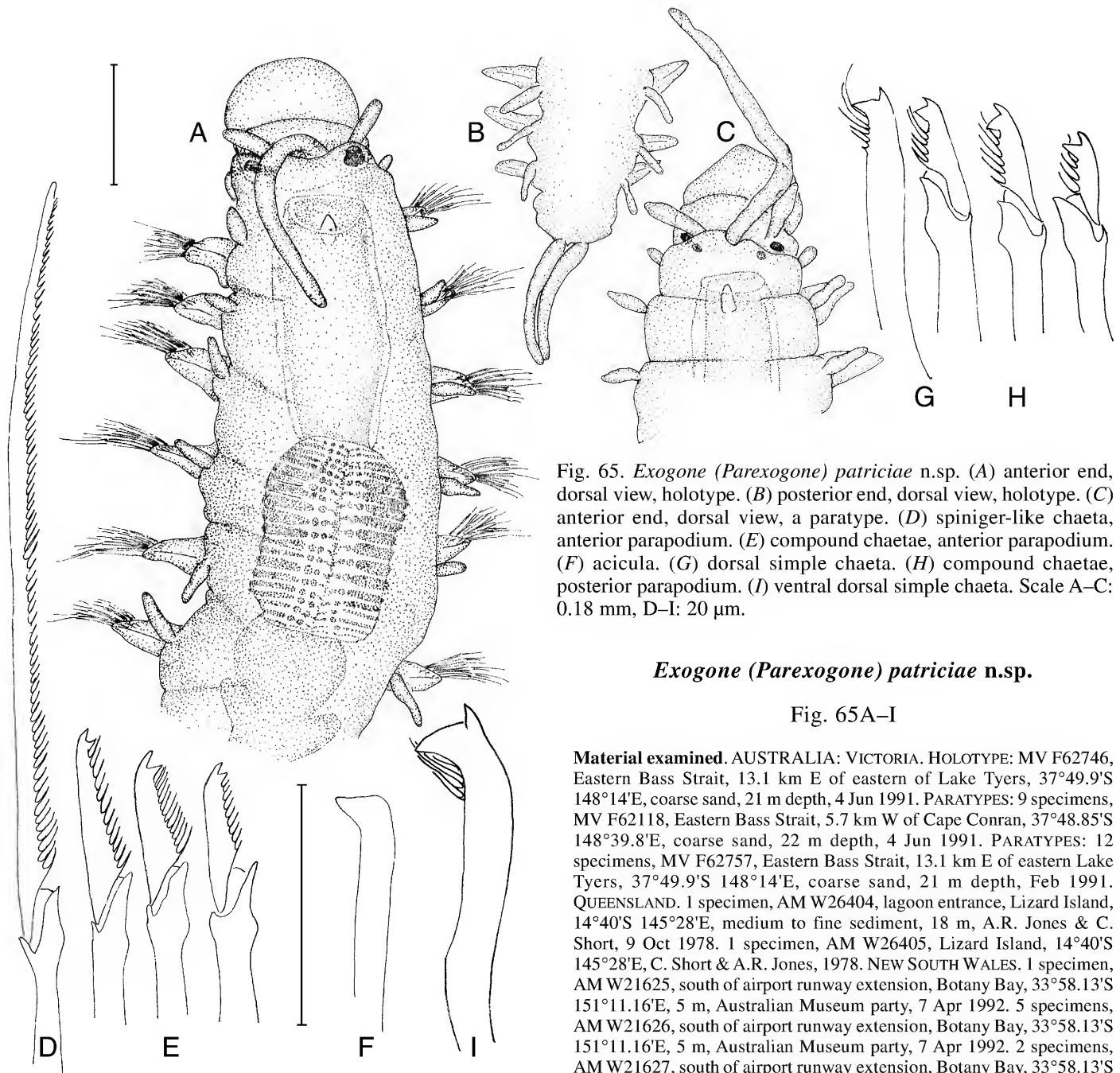


Fig. 65. *Exogone (Parexogone) patriciae* n.sp. (A) anterior end, dorsal view, holotype. (B) posterior end, dorsal view, holotype. (C) anterior end, dorsal view, a paratype. (D) spiniger-like chaeta, anterior parapodium. (E) compound chaetae, anterior parapodium. (F) acicula. (G) dorsal simple chaeta. (H) compound chaetae, posterior parapodium. (I) ventral dorsal simple chaeta. Scale A–C: 0.18 mm, D–I: 20 µm.

Exogone (Parexogone) patriciae n.sp.

Fig. 65A–I

Material examined. AUSTRALIA: VICTORIA. HOLOTYPE: MV F62746, Eastern Bass Strait, 13.1 km E of eastern of Lake Tyers, 37°49.9'S 148°14'E, coarse sand, 21 m depth, 4 Jun 1991. PARATYPES: 9 specimens, MV F62118, Eastern Bass Strait, 5.7 km W of Cape Conran, 37°48.85'S 148°39.8'E, coarse sand, 22 m depth, 4 Jun 1991. PARATYPES: 12 specimens, MV F62757, Eastern Bass Strait, 13.1 km E of eastern Lake Tyers, 37°49.9'S 148°14'E, coarse sand, 21 m depth, Feb 1991. QUEENSLAND. 1 specimen, AM W26404, lagoon entrance, Lizard Island, 14°40'S 145°28'E, medium to fine sediment, 18 m, A.R. Jones & C. Short, 9 Oct 1978. 1 specimen, AM W26405, Lizard Island, 14°40'S 145°28'E, C. Short & A.R. Jones, 1978. NEW SOUTH WALES. 1 specimen, AM W21625, south of airport runway extension, Botany Bay, 33°58.13'S 151°11.16'E, 5 m, Australian Museum party, 7 Apr 1992. 5 specimens, AM W21626, south of airport runway extension, Botany Bay, 33°58.13'S 151°11.16'E, 5 m, Australian Museum party, 7 Apr 1992. 2 specimens, AM W21627, south of airport runway extension, Botany Bay, 33°58.13'S 151°11.16'E, 5 m, Australian Museum party, 7 Apr 1992. 1 specimen, AM W26406, south of Worang Point, Twofold Bay, 37°03.5'S 149°56.5'E, benthic, 6.1 m, S. Keable, P. Albertson, 21 Feb 1985, E166. 1 specimen, AM W26522, south of airport runway extension, Botany Bay, 33°58.13'S 151°11.16'E, 5 m, Australian Museum party, 7 Apr 1992.

Description. Body long, slender, filiform, holotype 5.8 mm long, 0.1 mm wide, 59 chaetigers. Prostomium ovate, wider than long; 4 eyes in trapezoidal arrangement; median antennae long, about 2.5 times longer than combined length of prostomium and palps, cylindrical, inserted between posterior pair of eyes (Fig. 65A,C); lateral antennae similar in length to prostomium, inserted in front of anterior eyes. Palps broad, short, completely fused (Fig. 65A,C). Peristomium similar to following segments, covering posterior part of prostomium; tentacular cirri ovate, smaller than dorsal cirri; dorsal cirri on all parapodia, ovate, slightly shorter than parapodial lobes (Fig. 65A), elongate on posterior parapodia (Fig. 65B). Anterior parapodia each with 1–2 compound chaetae with long, spiniger-like, unidentate blade, provided with short, fine marginal spines, about 64 µm long, and 8–10 compound chaetae with bidentate

solitary, distally expanded and rounded (Fig. 64G). Pharynx long and slender, through about 4 segments; pharyngeal tooth on anterior rim (Fig. 64A). Proventricle short, through 1.5 segments, with about 17 muscle cell rows. Pygidium semi-circular, with 2 long anal cirri.

Remarks. The Australian specimens agree well with the previous descriptions, so I consider them as the same species, despite strong differences in habitat preference and wide distribution.

Distribution. USA (Florida and Gulf of México). Capbreton Canyon (Gulf of Biscay, between Spain and France). Eastern Mediterranean. Australia (Western Australia).

Habitat. Interstitial in sand, between 106 and 1,000 m depth. The Australian specimens have been collected in shallow waters, inside dead corals with other organisms.

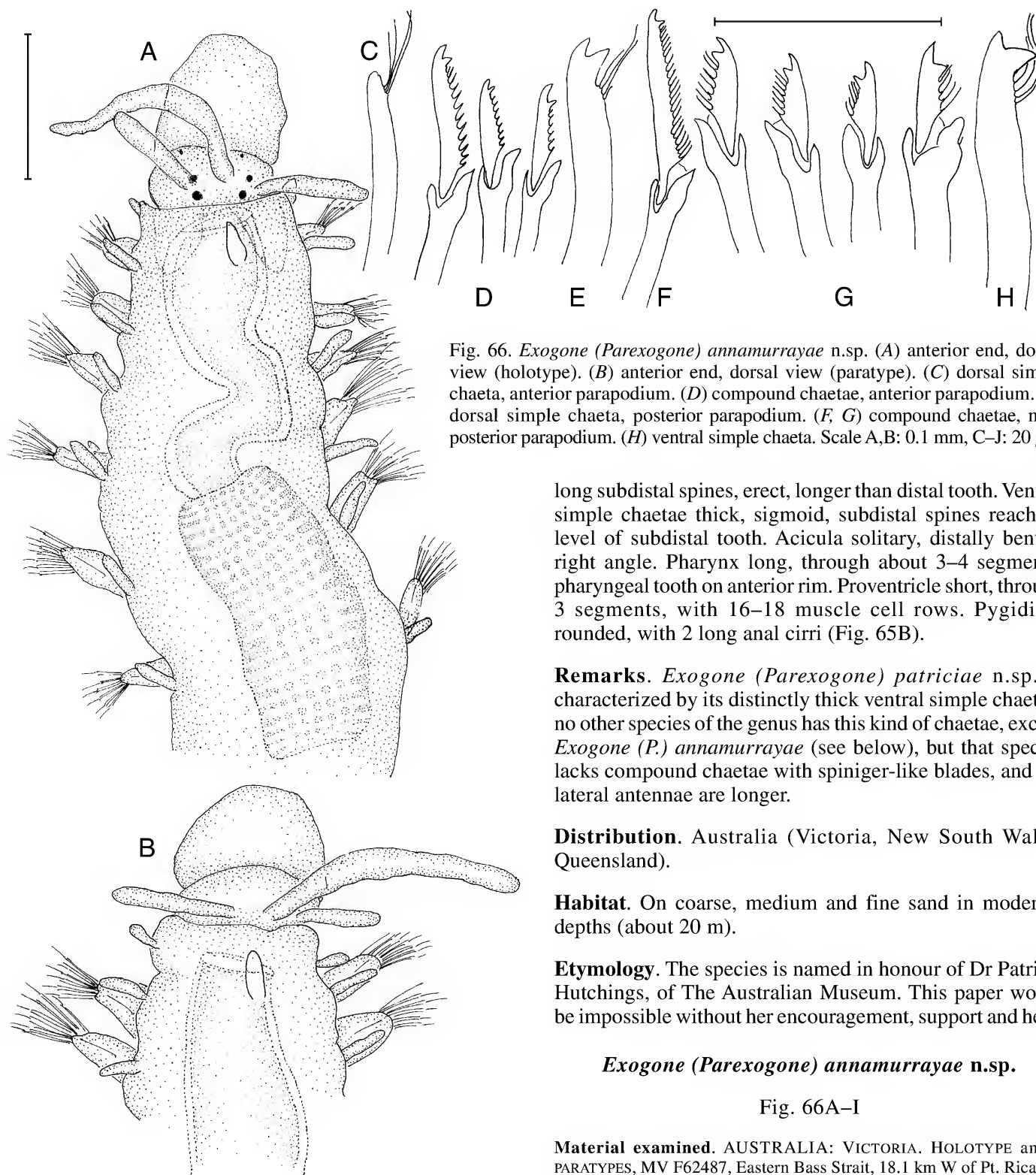


Fig. 66. *Exogone (Parexogone) annamurrayae* n.sp. (A) anterior end, dorsal view (holotype). (B) anterior end, dorsal view (paratype). (C) dorsal simple chaeta, anterior parapodium. (D) compound chaetae, anterior parapodium. (E) dorsal simple chaeta, posterior parapodium. (F, G) compound chaetae, mid-posterior parapodium. (H) ventral simple chaeta. Scale A,B: 0.1 mm, C-J: 20 µm.

long subdistal spines, erect, longer than distal tooth. Ventral simple chaetae thick, sigmoid, subdistal spines reaching level of subdistal tooth. Acicula solitary, distally bent at right angle. Pharynx long, through about 3–4 segments, pharyngeal tooth on anterior rim. Proventricle short, through 3 segments, with 16–18 muscle cell rows. Pygidium rounded, with 2 long anal cirri (Fig. 65B).

Remarks. *Exogone (Parexogone) patriciae* n.sp. is characterized by its distinctly thick ventral simple chaetae; no other species of the genus has this kind of chaetae, except *Exogone (P.) annamurrayae* (see below), but that species lacks compound chaetae with spiniger-like blades, and the lateral antennae are longer.

Distribution. Australia (Victoria, New South Wales, Queensland).

Habitat. On coarse, medium and fine sand in moderate depths (about 20 m).

Etymology. The species is named in honour of Dr Patricia Hutchings, of The Australian Museum. This paper would be impossible without her encouragement, support and help.

***Exogone (Parexogone) annamurrayae* n.sp.**

Fig. 66A–I

Material examined. AUSTRALIA: VICTORIA. HOLOTYPE and 8 PARATYPES, MV F62487, Eastern Bass Strait, 18.1 km W of Pt. Ricardo, 37°49.30'S 148°25.44'E, sand and shell, 27 m, 28 Sep 1990. PARATYPE: 1 specimen, MV F62734, Eastern Bass Strait, Victoria, 5 km W of Cape Conran, 37°48.85'S 148°39.85'E, coarse sand, 22 m, Feb 1991.

Description. Body long, slender, filiform, holotype is a complete specimen, broken in two pieces, 5 mm long, 0.16 mm wide, 60 chaetigers. Prostomium ovate, wider than long; 4 small eyes nearly in square arrangement and 2 minute anterior eyespots (Fig. 66A), but most of the examined specimens apparently without eyes, which disappear after fixation (Fig. 66B). Antennae inserted approximately on middle along of prostomium; median antenna long, approximately twice as long as combined length of prostomium and palps, lateral antennae similar in length to combined length of prostomium and palps (Fig. 66B) or

falcigers, teeth similar, provided with moderately long marginal spines, slight dorsoventral gradation in length, 16.8 µm above, 12.4 µm below. Posteriorly spiniger-like chaetae are lost and chaetae with shorter blades replace them, the numbers of falcigers per parapodium decreasing to 5 in midbody; posterior parapodia each with 4 falcigers, blades short, subdistal tooth large, and distal tooth smaller, forming a wide angle between them; long marginal spines, erect, longer towards tips, extending beyond tip of subdistal tooth, blades 9 µm above, 8 µm below. Dorsal and ventral simple chaetae from chaetiger 26 in holotype, thick, strongly bidentate, with long, broad, triangular subdistal tooth much larger than distal tooth; dorsal simple chaetae provided with

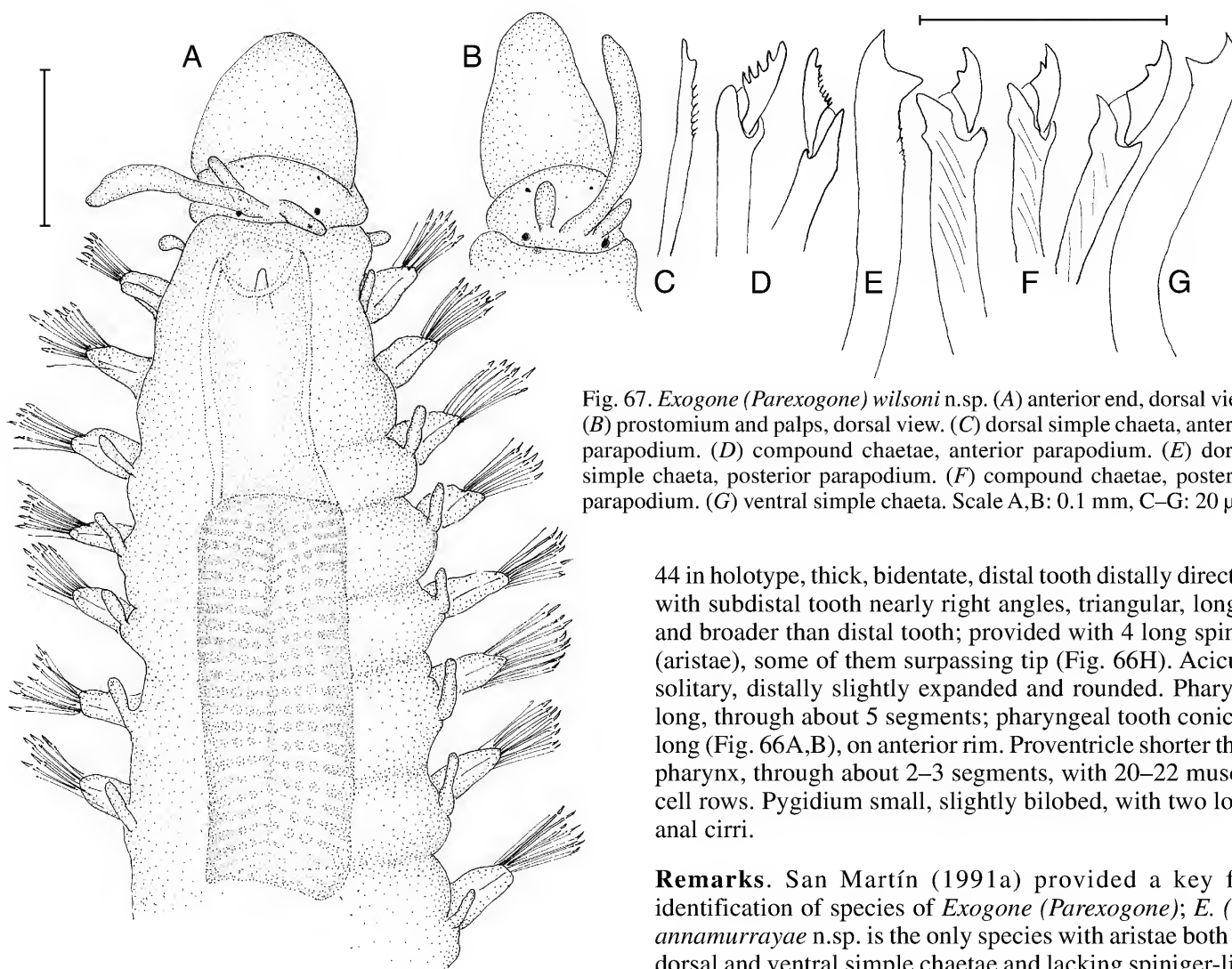


Fig. 67. *Exogone (Parexogone) wilsoni* n.sp. (A) anterior end, dorsal view. (B) prostomium and palps, dorsal view. (C) dorsal simple chaeta, anterior parapodium. (D) compound chaetae, anterior parapodium. (E) dorsal simple chaeta, posterior parapodium. (F) compound chaetae, posterior parapodium. (G) ventral simple chaeta. Scale A,B: 0.1 mm, C–G: 20 μ m.

slightly shorter (Fig. 66A). Palps completely fused to each other, similar in length to prostomium or longer. Prostomium similar in length to following segments, covering posterior margin of prostomium; tentacular cirri small, papilliform (Fig. 66A,B). Dorsal cirri on all segments, oval, elongate, shorter than parapodial lobes (Fig. 66A,B). Anterior parapodia each with about 5–6 compound chaetae, with hemigomph articulation, smooth shafts, and short, bidentate blades with both teeth similar or subdistal tooth slightly smaller than distal tooth, short marginal spines (Fig. 66D), showing slight dorsoventral gradation in length, 14 μ m above, 9.6 μ m below. Number of compound chaetae on each parapodium decreasing posteriorly to 3 on each posterior parapodia, one of these with slight elongate blade, bidentate with both teeth similar and short marginal spines (Fig. 66F), about 17 μ m long, and other two compound chaetae with short blades, strongly bidentate, and moderately long marginal spines (Fig. 66I), about 10–11 μ m long; posteriormost parapodia with all chaetae similar to those described above (Fig. 66G), usually one with thick shaft and broad subdistal tooth, forming wide angle with distal tooth (Fig. 66J). Dorsal simple chaetae from about chaetiger 6; anterior dorsal simple chaetae slender, indistinctly bidentate, marginally smooth, provided with 4 long subdistal spines, extending beyond tip (Fig. 66C); progressively, dorsal simple chaetae thicker, broader, more strongly bidentate, with subdistal tooth slightly longer than distal one (Fig. 66E). Ventral simple chaetae from chaetiger

44 in holotype, thick, bidentate, distal tooth distally directed with subdistal tooth nearly right angles, triangular, longer and broader than distal tooth; provided with 4 long spines (aristae), some of them surpassing tip (Fig. 66H). Acicula solitary, distally slightly expanded and rounded. Pharynx long, through about 5 segments; pharyngeal tooth conical, long (Fig. 66A,B), on anterior rim. Proventricle shorter than pharynx, through about 2–3 segments, with 20–22 muscle cell rows. Pygidium small, slightly bilobed, with two long anal cirri.

Remarks. San Martín (1991a) provided a key for identification of species of *Exogone (Parexogone)*; *E. (P.) annamurrayae* n.sp. is the only species with aristae both on dorsal and ventral simple chaetae and lacking spiniger-like chaetae.

Distribution. Australia (Victoria).

Habitat. On coarse sand, in moderate depths (c. 20–30 m).

Etymology. The species is named in honour of Miss Anna Murray, of The Australian Museum.

Exogone (Parexogone) wilsoni n.sp.

Fig. 67A–G

Material examined. AUSTRALIA: VICTORIA. HOLOTYPE and 28 PARATYPES, MV F62118, Eastern Bass Strait, 5.7 km W of Cape Conran, 37°48.85'S 148°39.85'E, coarse sand, 22 m, 4 Jun 1991. PARATYPE: 1 specimen, MV F62734, Eastern Bass Strait, 5.7 km of Cape Conran, 37°48.85'S 148°39.80'E, 22 m depth, Feb 1991. PARATYPES: 2 specimens, MV F87423, Southern Port Phillip Bay, 144°55'E 38°21'S, sand, 4 m, 12 Oct 1971. NEW SOUTH WALES. 1 specimen, AM W21623, 1500 m offshore, east of Ramsgate Baths, Botany Bay, 33°59.16'S 151°09.96'E, 5 m, Australian Museum party, 7 Apr 1992. 1 specimen, AM W21624, 500 m west of north Port Botany, east Botany Bay, 33°58.28'S 151°11.98'E, 7 m, Australian Museum party, 28 July 1992. 1 specimen, AM W22621, Cararma Inlet, Jervis Bay, 35°0'S 150°46.5'E, *Zostera capricorni*, L. Howitt, Mar 1989. 1 specimen, AM W23580, Foreshore Beach, Botany Bay, 33°57.4'S 151°11.4'E, sand, Kinhill Engineers, Jan 1992. 1 specimen, AM W23913, Port Hacking, 34°04.11'S 151°06.37'E, sand, 13.4 m, Australian Museum Party, 31 May 1994. 1 specimen, AM W23914, Port Hacking, 34°04.00'S 151°06.38'E, sand, 16.9 m, Australian Museum Party, 10 Aug 1995. 1 specimen, AM W26515, south of airport runway extension, northeast Botany Bay, 33°58.13'S 151°11.16'E, 5 m, Australian Museum party, 6 Apr 1992, NSW 767. 1 specimen, AM W26516, south of airport runway extension, northeast Botany Bay,

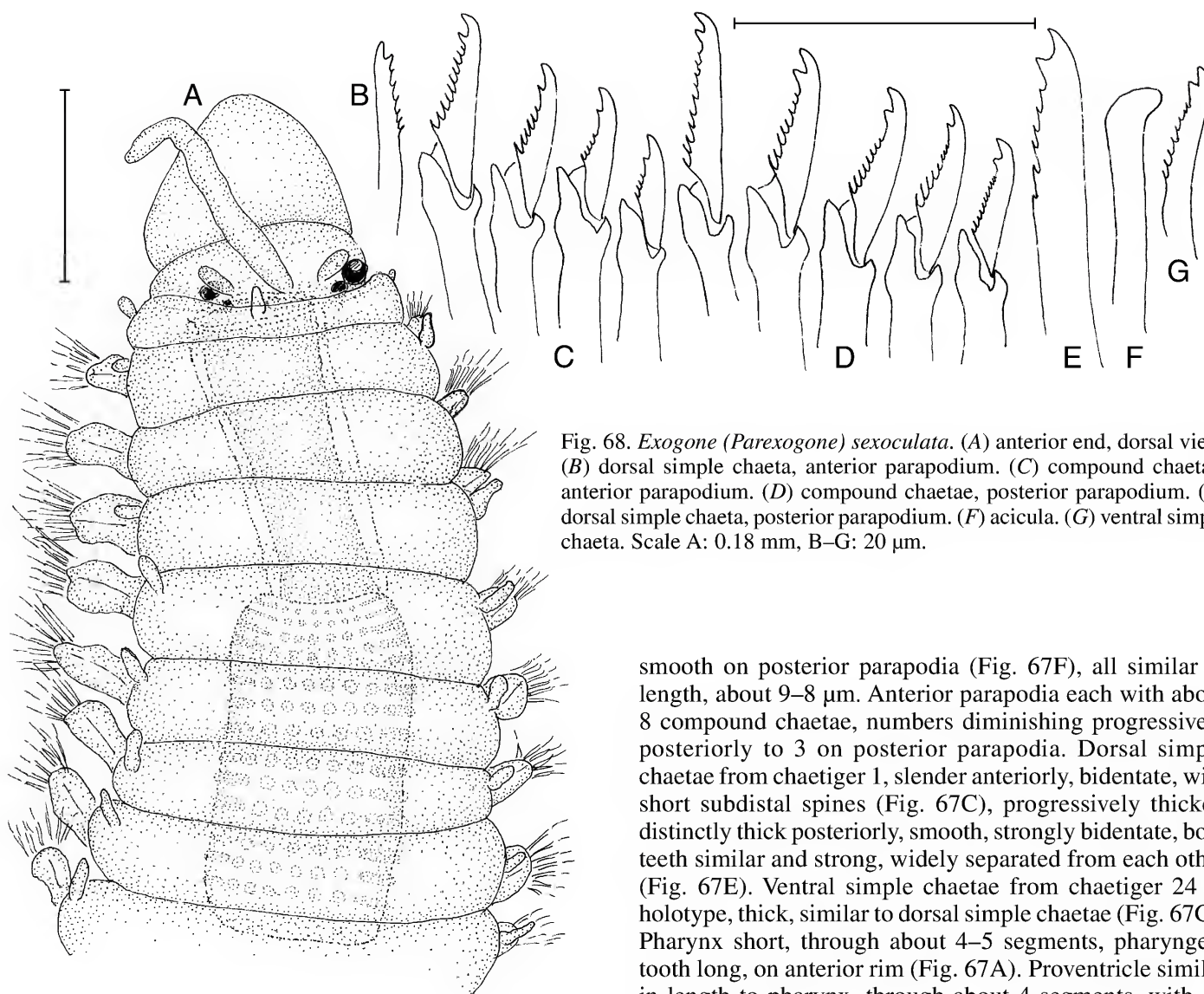


Fig. 68. *Exogone (Parexogone) sexoculata*. (A) anterior end, dorsal view. (B) dorsal simple chaeta, anterior parapodium. (C) compound chaetae, anterior parapodium. (D) compound chaetae, posterior parapodium. (E) dorsal simple chaeta, posterior parapodium. (F) acicula. (G) ventral simple chaeta. Scale A: 0.18 mm, B–G: 20 μ m.

33°58.13'S 151°11.16'E, 5 m, Australian Museum party, 6 Apr 1992. 1 specimen, AM W26517, 800–1000 m off Port Botany, east side of Botany Bay, 33°58.75'S 151°11.03'E, 7 m, Australian Museum party, 6 Apr 1992. 1 specimen, AM W26518, 800 m WSW from tip of airport runway extension, Botany Bay, 33°58.33'S 151°10.22'E, 7 m, Australian Museum party, 27 July 1992.

Description. Body small and slender, moderately long, 2.8 mm long, 0.2 mm wide, 40 chaetigers. Prostomium oval, wider than long; 4 small eyes in trapezoidal arrangement and 2 minute anterior eyespots (Fig. 67A,B); antennae inserted close to each other, just in front of anterior eyes, lateral antenna cylindrical, long, similar in length to combined length of prostomium and palps, lateral antennae about $\frac{1}{4}$ length of median antenna. Palps broad, completely fused to each other, forming a triangular piece, slightly longer than prostomium. Peristomium similar in length to following segments, covering dorsally posterior end of prostomium; tentacular cirri papilliform. Dorsal cirri papilliform, shorter than parapodial lobes, smaller than lateral antennae but slightly larger than tentacular cirri, absent on chaetiger 2 (Fig. 67A). Compound chaetae with smooth, thick shafts, thicker and becoming more angular posteriorly; blades short, bidentate, subdistal tooth small, well separated from distal tooth on posterior parapodia, with short marginal spines on anterior parapodia (Fig. 67D),

smooth on posterior parapodia (Fig. 67F), all similar in length, about 9–8 μ m. Anterior parapodia each with about 8 compound chaetae, numbers diminishing progressively posteriorly to 3 on posterior parapodia. Dorsal simple chaetae from chaetiger 1, slender anteriorly, bidentate, with short subdistal spines (Fig. 67C), progressively thicker, distinctly thick posteriorly, smooth, strongly bidentate, both teeth similar and strong, widely separated from each other (Fig. 67E). Ventral simple chaetae from chaetiger 24 in holotype, thick, similar to dorsal simple chaetae (Fig. 67G). Pharynx short, through about 4–5 segments, pharyngeal tooth long, on anterior rim (Fig. 67A). Proventricle similar in length to pharynx, through about 4 segments, with 18 muscle cell rows.

Remarks. *Exogone (Parexogone) wilsoni* n.sp. is similar to *E. (P.) hebes* from Atlantic coasts of North America and Europe; *E. (P.) wilsoni*, however, has proportionally longer median antenna and the chaetae, although similar, are different, with smaller proximal tooth and some spines on the margin (see San Martín, 2003). *Exogone (P.) parahomosea* Hartmann-Schröder, 1974b, from South Africa, as well as its subspecies *mediterranea* from the Mediterranean Sea, have the dorsal simple chaetae marginally serrated, and the blades of compound chaetae are provided with long and thick marginal spines (Hartmann-Schröder, 1974b; San Martín, 1984a, 2003). *Exogone (Parexogone) breviseta* Kudenov & Harris, 1995, from California, has shorter antennae, proportionally longer blades on the compound chaetae, and lacks compound chaetae with large shafts and short blades, with subdistal tooth well separated from distal tooth, smooth on margin (see Kudenov & Harris, 1995); in addition, the dorsal and ventral simple chaetae are not as thick as those present in *E. (P.) wilsoni*.

Distribution. Australia (Victoria, New South Wales).

Habitat. Sand, 4–22 m depth.

Etymology. The species is named in honour of Dr Robin Wilson, of the Museum of Victoria.

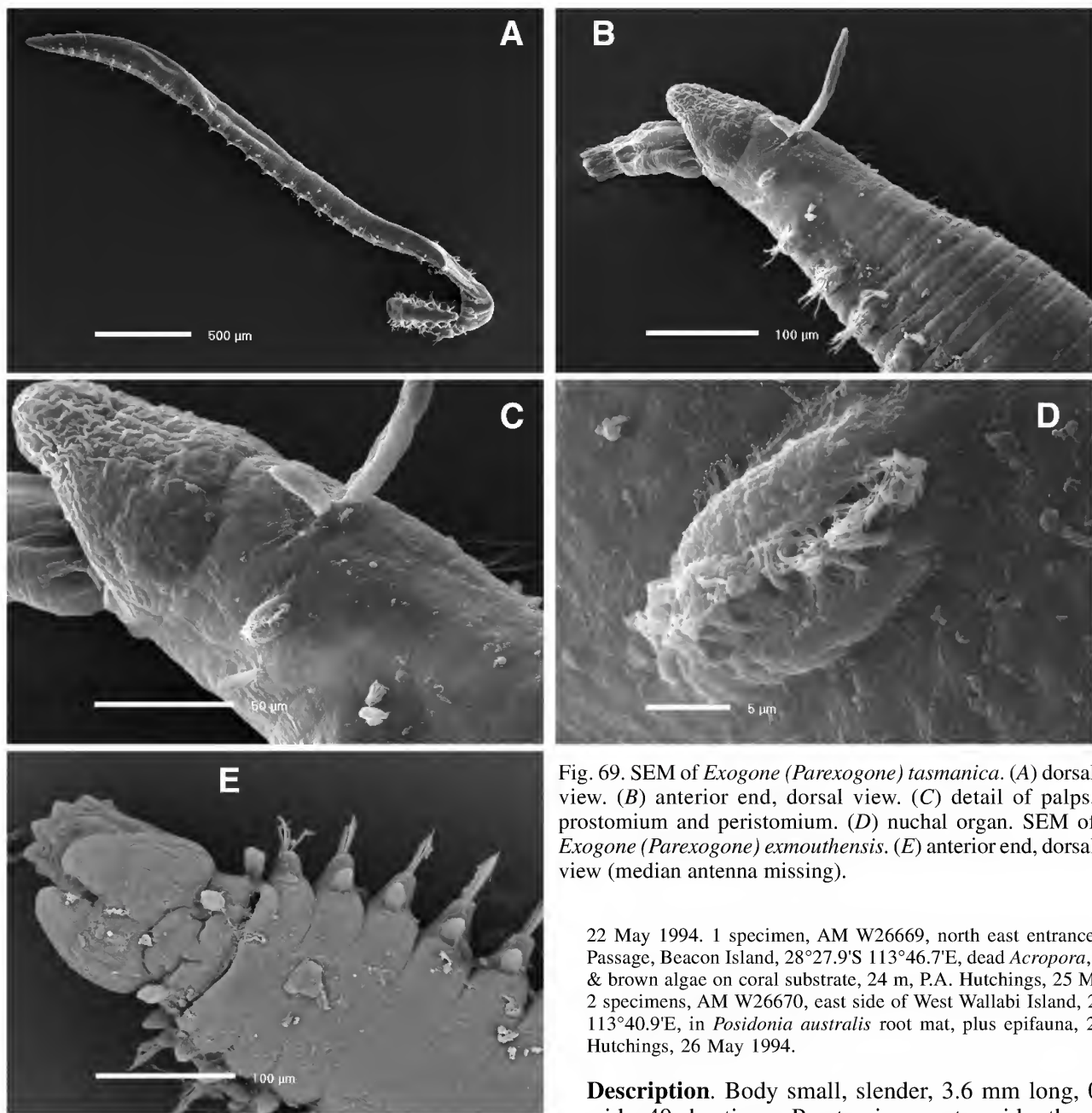


Fig. 69. SEM of *Exogone* (*Parexogone*) *tasmanica*. (A) dorsal view. (B) anterior end, dorsal view. (C) detail of palps, prostomium and peristomium. (D) nuchal organ. SEM of *Exogone* (*Parexogone*) *exmouthensis*. (E) anterior end, dorsal view (median antenna missing).

22 May 1994. 1 specimen, AM W26669, north east entrance to Goss Passage, Beacon Island, 28°27.9'S 113°46.7'E, dead *Acropora*, coralline & brown algae on coral substrate, 24 m, P.A. Hutchings, 25 May 1994. 2 specimens, AM W26670, east side of West Wallabi Island, 28°27.9'S 113°40.9'E, in *Posidonia australis* root mat, plus epifauna, 2 m, P.A. Hutchings, 26 May 1994.

***Exogone* (*Parexogone*) *sexoculata*
Hartmann-Schröder, 1979**

Fig. 68A–G

Exogone sexoculata Hartmann-Schröder, 1979: 10, figs. 175–177; 1980a: 56; 1981: 38; 1982: 74; 1986: 45; 1987: 42; 1989: 31; 1990: 55; 1991: 42.

Material examined. AUSTRALIA: NEW SOUTH WALES. 1 specimen, AM W23540, Weeney Bay, Botany Bay, 34°01.3'S 151°09.7'E, mud, 1 m, A. Roach & A. Jones, 30 Mar 1995. 1 specimen, AM W23541, Weeney Bay, Botany Bay, 34°01.3'S 151°09.7'E, mud, 1 m, A. Roach & A. Jones, 30 Mar 1995. 1 specimen, AM W26407, 800 m WSW from tip of airport runway extension, Botany Bay, 33°58.33'S 151°10.22'E, 7 m, Australian Museum Party, 6 Apr 1992. 13 specimens, and 4 specimens on SEM stub, AM W27441, Waratah Bay, Cowan Creek, 33°37.8'S 151°09.9'E, 4.5 m, A. Jones & party, 03 Oct 1980. 11 specimens, AM W196617, small bay in Cowan Creek, Hawkesbury River, 33°39.0'S 151°09.5'E, 7.5 m, A. Jones & party, 04 Oct 1980. SOUTH AUSTRALIA. 1 specimen, AM W26754, Victor Harbour, 35°33'S 138°38'E, algal washings, P.A. Hutchings, 16 Mar 1979. WESTERN AUSTRALIA. 2 specimens, AM W26668, north end of Long Island, Goss Passage, 28°28.3'S 113°46.3'E, dead coral covered with coralline algae & boring bivalves, 8 m, C. Bryce,

Description. Body small, slender, 3.6 mm long, 0.2 mm wide, 40 chaetigers. Prostomium ovate, wider than long, 2 pairs of large eyes in trapezoidal arrangement, anterior pair larger than posterior eyes, and 2 anterior eyespots; median antenna long, slightly longer than combined length of prostomium and palps, cylindrical, inserted between posterior pair of eyes, lateral antennae small, ovoid, inserted close to inner margin of anterior eyes, slightly in front of line of insertion of median antenna (Fig. 68A). Palps fused along their length, longer than prostomium, forming a triangular, broad piece. Peristomium slightly shorter than following segments; tentacular cirri minute, smaller than lateral antennae. Dorsal cirri small, with slightly bulbous bases, much shorter than parapodial lobes, absent on chaetiger 2 (Fig. 68A). Parapodial lobes ending on a rounded distal papilla. Compound chaetae similar throughout, all bidentate falcigers, with distinct subdistal tooth, short, thin marginal spines and dorsoventral gradation in length, blades 12–13 µm above, 8 µm below; some blades on some specimens slightly longer on anterior parapodia (Fig. 68C,D); parapodia each with about 6–7 compound chaetae. Dorsal simple chaetae from anterior parapodia, distinctly bidentate, with short marginal spines, slender on anterior parapodia (Fig. 68B), thicker on posterior segments (Fig.

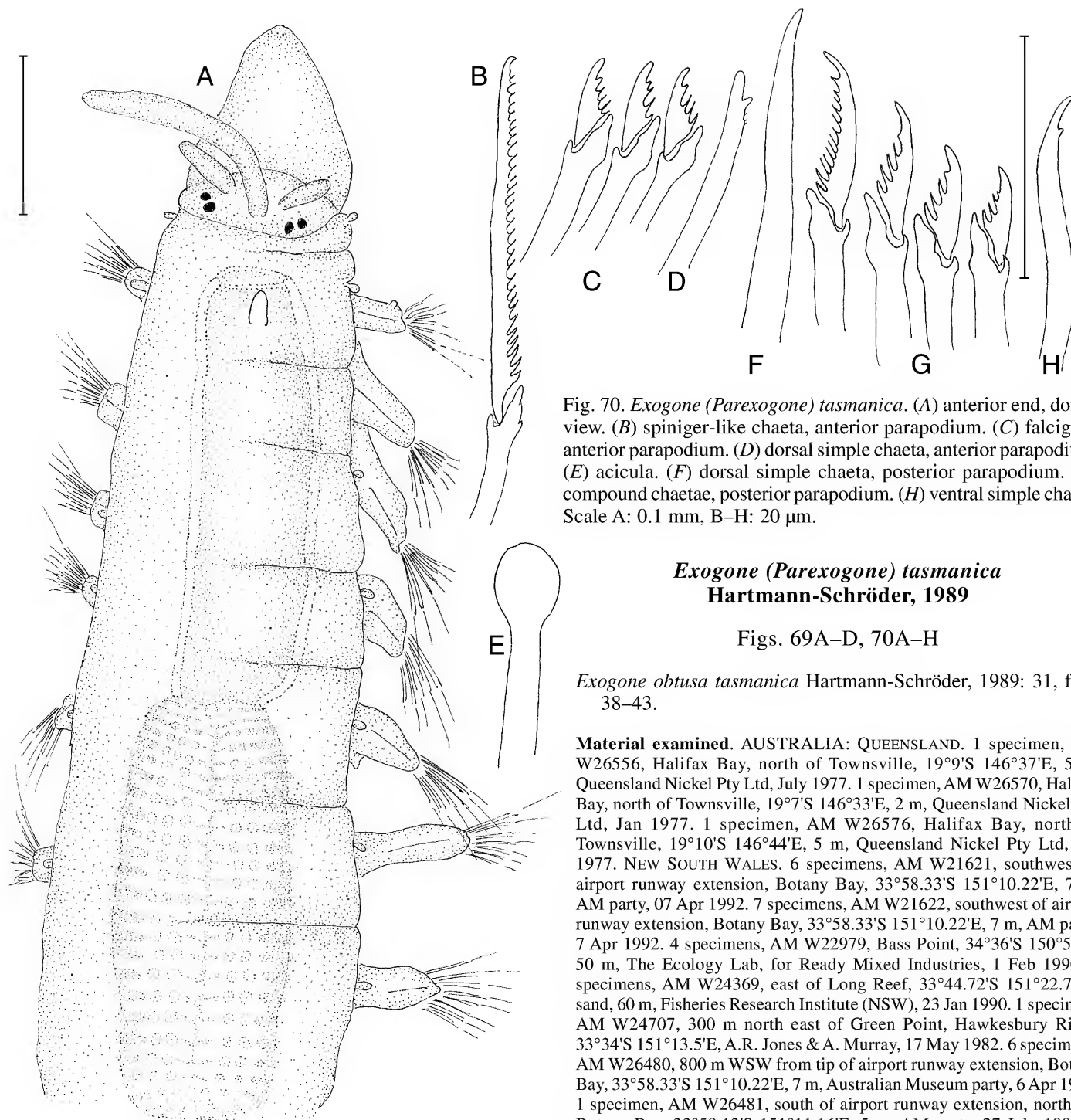


Fig. 70. *Exogone (Parexogone) tasmanica*. (A) anterior end, dorsal view. (B) spiniger-like chaeta, anterior parapodium. (C) falcigers, anterior parapodium. (D) dorsal simple chaeta, anterior parapodium. (E) acicula. (F) dorsal simple chaeta, posterior parapodium. (G) compound chaetae, posterior parapodium. (H) ventral simple chaeta. Scale A: 0.1 mm, B–H: 20 µm.

Exogone (Parexogone) tasmanica
Hartmann-Schröder, 1989

Figs. 69A–D, 70A–H

Exogone obtusa tasmanica Hartmann-Schröder, 1989: 31, figs. 38–43.

Material examined. AUSTRALIA: QUEENSLAND. 1 specimen, AM W26556, Halifax Bay, north of Townsville, 19°9'S 146°37'E, 5 m, Queensland Nickel Pty Ltd, July 1977. 1 specimen, AM W26570, Halifax Bay, north of Townsville, 19°7'S 146°33'E, 2 m, Queensland Nickel Pty Ltd, Jan 1977. 1 specimen, AM W26576, Halifax Bay, north of Townsville, 19°10'S 146°44'E, 5 m, Queensland Nickel Pty Ltd, Jan 1977. NEW SOUTH WALES. 6 specimens, AM W21621, southwest of airport runway extension, Botany Bay, 33°58.33'S 151°10.22'E, 7 m, AM party, 07 Apr 1992. 7 specimens, AM W21622, southwest of airport runway extension, Botany Bay, 33°58.33'S 151°10.22'E, 7 m, AM party, 7 Apr 1992. 4 specimens, AM W22979, Bass Point, 34°36'S 150°54'E, 50 m, The Ecology Lab, for Ready Mixed Industries, 1 Feb 1990. 2 specimens, AM W24369, east of Long Reef, 33°44.72'S 151°22.72'E, sand, 60 m, Fisheries Research Institute (NSW), 23 Jan 1990. 1 specimen, AM W24707, 300 m north east of Green Point, Hawkesbury River, 33°34'S 151°13.5'E, A.R. Jones & A. Murray, 17 May 1982. 6 specimens, AM W26480, 800 m WSW from tip of airport runway extension, Botany Bay, 33°58.33'S 151°10.22'E, 7 m, Australian Museum party, 6 Apr 1992. 1 specimen, AM W26481, south of airport runway extension, northeast Botany Bay, 33°58.13'S 151°11.16'E, 5 m, AM party, 27 July 1992. 2 specimens, AM W26482, 800 m WSW from tip of airport runway extension, Botany Bay, 33°58.33'S 151°10.22'E, 7 m, AM party, 6 Apr 1992. 1 specimen, AM W26483, 800 m WSW from tip of airport runway extension, Botany Bay, 33°58.33'S 151°10.22'E, 7 m, AM party, 6 Apr 1992. 1 specimen, AM W26484, 800 m WSW from tip of airport runway extension, Botany Bay, 33°58.33'S 151°10.22'E, 7 m, AM party, 6 Apr 1992. 1 specimen, AM W26485, 800 m WSW from tip of airport runway extension, Botany Bay, 33°58.33'S 151°10.22'E, 7 m, AM party, 6 Apr 1992. 4 specimens, AM W26486, 800 m WSW from tip of airport runway extension, Botany Bay, 33°58.33'S 151°10.22'E, 7 m, AM party, 6 Apr 1992. 4 specimens, AM W26487, 800 m WSW from tip of airport runway extension, Botany Bay, 33°58.33'S 151°10.22'E, 7 m, AM party, 6 Apr 1992. 1 specimen, AM W26488, 800 m WSW from tip of airport runway extension, Botany Bay, 33°58.33'S 151°10.22'E, 7 m, AM party, 6 Apr 1992. 3 specimens, AM W26489, 800–1000 m off Port Botany, east of Botany Bay, 33°58.75'S 151°11.03'E, 7 m, AM party, 6 Apr 1992. 2 specimens, AM W26490, 800–1000 m off Port Botany, east of Botany Bay, 33°58.75'S 151°11.03'E, 7 m, AM party, 6 Apr 1992. 1 specimen, AM W26491, 800–1000 m off Port Botany, east of Botany Bay, 33°58.75'S 151°11.03'E, 7 m, AM party, 6 Apr 1992. 2 specimens, AM W26492, 800–1000 m off Port Botany, east of Botany Bay, 33°58.75'S 151°11.03'E, 7 m, AM party, 6 Apr 1992. 3 specimens, AM W26493,

68E). Ventral simple chaetae on posterior parapodia, sigmoid, distinctly bidentate, with short marginal spines (Fig. 68G). Solitary acicula distally curved, sometimes with an additional slender, straight acicula on anterior parapodia (Fig. 68F). Pharynx through about 4–5 segments; pharyngeal tooth on anterior rim (Fig. 68A). Proventricle through 4 segments, with 19–20 muscle cell rows.

Distribution. Australia (all States).

Habitat. Sand, mud, algae, dead corals; a common species on shallow water, down to about 24 m depth.

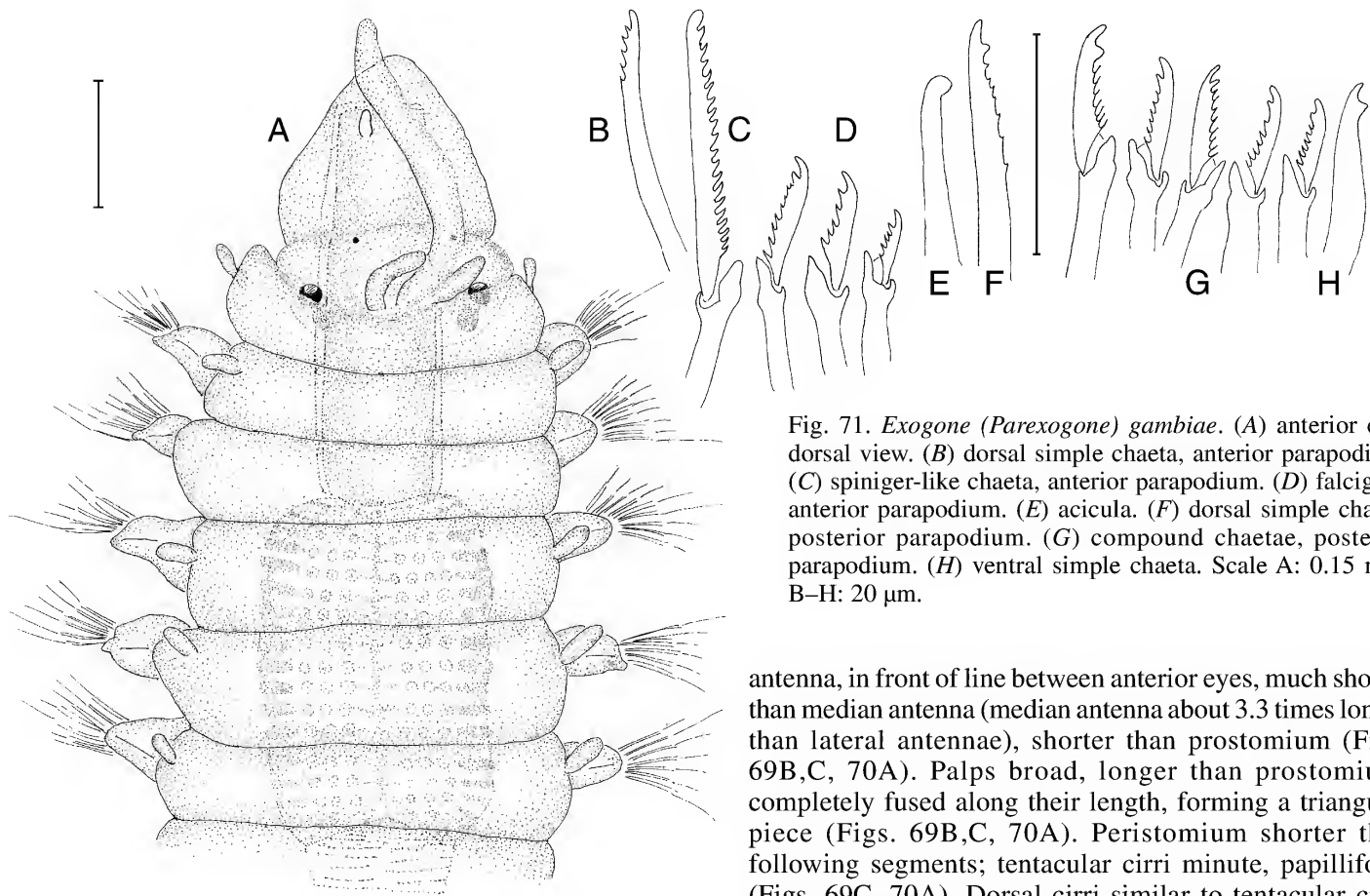


Fig. 71. *Exogone (Parexogone) gambiae*. (A) anterior end, dorsal view. (B) dorsal simple chaeta, anterior parapodium. (C) spiniger-like chaeta, anterior parapodium. (D) falcigers, anterior parapodium. (E) acicula. (F) dorsal simple chaeta, posterior parapodium. (G) compound chaetae, posterior parapodium. (H) ventral simple chaeta. Scale A: 0.15 mm, B–H: 20 µm.

800–1000 m off Port Botany, east of Botany Bay, 33°58.75'S 151°11.03'E, 7 m, AM party, 6 Apr 1992. 1 specimen, AM W26494, 200–500 m west of airport runway extension, Botany Bay, 33°57.82'S 151°10.43'E, 7 m, AM party, 6 Apr 1992. 2 specimens, AM W26495, 200–500 m west of airport runway extension, Botany Bay, 33°58.28'S 151°11.98'E, 7 m, AM party, 6 Apr 1992. 1 specimen, AM W26496, 200–500 m west of airport runway extension, Botany Bay, 33°58.28'S 151°11.98'E, 7 m, AM party, 6 Apr 1992. 2 specimens, AM W26497, 200–500 m west of airport runway extension, Botany Bay, 33°58.28'S 151°11.98'E, 7 m, AM party, 6 Apr 1992. 1 specimen, AM W26498, south of airport runway extension, northeast Botany Bay, 33°58.13'S 151°11.16'E, 5 m, AM party, 6 Apr 1992. 1 specimen, AM W26499, south of airport runway extension, northeast Botany Bay, 33°58.13'S 151°11.16'E, 5 m, AM party, 6 Apr 1992. 2 specimens, AM W27130, near Hungry Beach, Hawkesbury River, 33°34.5'S 151°16.5'E, sandy mud, 4 m, A. Jones & A. Murray, 17 May 1982. 1 specimen, AM W196618, Hawkesbury River, Juno Head-Hungry Beach, 33°34.5'S 151°16.5'E, mud, 4 m, A. Jones & A. Murray, 22 Feb 1980. 1 specimen, AM W196619, between Juno Point & Hungry Beach, Hawkesbury River, 33°34.5'S 151°16.5'E, sandy mud, 12 m, A. Jones & C. Short, 05 May 1977. 1 specimen, AM W196620, Juno Head-Hungry Beach, Hawkesbury River, 33°34.5'S 151°16.5'E, sandy mud, middle of river, 10 m, A. Jones & C. Short, 05 May 1977. 2 specimens, AM W196622, Green Pt.–Croppy Pt. Hawkesbury River, 33°33.5'S 151°14.5'E, mud, 6 m, A. Jones & party, 22 Feb 1980. 1 specimen, AM W196623, east end Brooklyn Boat Channel, Hawkesbury River, 33°33'S 151°14'E, A. Jones & party, 16 May 1980. TASMANIA. 16 specimens, AM W27669, near freshwater stream, Parsons Cove, Freycinet National Park, 42°08.6'S 148°16.9'E, clean gravelly sand, intertidal, 0 m, N.W. Riser, 24 Jan 1986. WESTERN AUSTRALIA. 1 specimen, AM W27459, limestone reef, off Ned's camp, Cape Range National Park, 21°59'S 113°55'E, sponge with epiphytic algae, and muddy worm tubes, 1.5 m, R.T. Springthorpe, 2 Jan 1984.

Description. Body long and slender, filiform (Fig. 69A), 4.8 mm long, 0.2 mm wide, 41 chaetigers. Prostomium ovate, wider than long; 4 eyes in trapezoidal arrangement and, sometimes, 2 anterior eyespots; median antenna inserted close to middle of prostomium, long, cylindrical, slightly longer than combined length of prostomium and palps (Fig. 69B); lateral antennae located near median

antenna, in front of line between anterior eyes, much shorter than median antenna (median antenna about 3.3 times longer than lateral antennae), shorter than prostomium (Figs. 69B,C, 70A). Palps broad, longer than prostomium, completely fused along their length, forming a triangular piece (Figs. 69B,C, 70A). Peristomium shorter than following segments; tentacular cirri minute, papilliform (Figs. 69C, 70A). Dorsal cirri similar to tentacular cirri, much smaller than parapodial lobes, absent on chaetiger 2 (Figs. 69B, 70A); parapodial lobes elongate, with a distal papilla. Anterior parapodia each with 1–2 compound chaetae provided with elongate, spiniger-like blades, unidentate or provided with a minute subdistal spine, distally curved, with short marginal spines (Fig. 70B), 30 µm long; in addition 8–9 compound chaetae with short, bidentate falcigers, subdistal tooth small, and short marginal spines (Fig. 70C), all similar in length, about 8 µm long. Decreasing number and length of spiniger-like chaetae posteriorly, only one on midbody segments, lacking on posterior parapodia; posterior parapodia each with 5–6 compound chaetae, with curved blades, moderate marginal spines, with dorsoventral gradation in length (Fig. 70G), 15 µm above, 8 µm below; ventralmost posterior compound chaetae nearly unidentate. Dorsal simple chaetae from anterior parapodia; anterior dorsal simple chaetae slender, provided with a subdistal tooth and short marginal spines (Fig. 70D), becoming progressively thicker, smooth and unidentate posteriorly (Fig. 70F). Ventral simple chaetae on posterior parapodia, sigmoid, smooth, slightly bidentate (Fig. 70H). Acicula solitary, distally expanded and rounded (Fig. 70E). Pharynx through 4–5 segments; pharyngeal tooth on anterior rim (Fig. 70A). Proventricle through 2–3 segments, with about 24 muscle cell rows.

Remarks. *Exogone (P.) molesta* Banse, 1972, from the Northeast Pacific is similar, but the antennae are distinctly shorter and the dorsal cirri are longer (Banse, 1972).

Distribution. Australia (Tasmania, New South Wales, Queensland).

Habitat. Sand, mud, from shallow sediments up to 60 m depth.

Exogone (Parexogone) gambiae
Lanera, Sordino & San Martín, 1994

Fig. 71A–H

Exogone (Parexogone) gambiae Lanera *et al.*, 1994: 236, figs. 2, 3; San Martín, 2003.

Material examined. AUSTRALIA: QUEENSLAND. 1 specimen, AM W26549, Halifax Bay, north of Townsville, 19°10'S 146°38'E, 5 m, Queensland Nickel Pty Ltd, Jan 1977. 1 specimen, AM W26550, Halifax Bay, north of Townsville, 19°9'S 146°37'E, 5 m, Queensland Nickel Pty Ltd, July 1977. 4 specimens, AM W26551, Halifax Bay, north of Townsville, 19°10'S 146°44'E, 5 m, Queensland Nickel Pty Ltd, July 1977. 2 specimens, AM W26554, Halifax Bay, north of Townsville, 19°10'S 146°38'E, 5 m, Queensland Nickel Pty Ltd, July 1977. 1 specimen, AM W26563, Halifax Bay, north of Townsville, 19°10'S 146°38'E, 5 m, Queensland Nickel Pty Ltd, July 1977. NEW SOUTH WALES. 1 specimen, AM W26435, 100 m north west of Split Solitary Island, 30°14.0'S 153°10.8'E, mixed red algae, 15 m, S.J. Keable, 7 Mar 1992. SOUTH AUSTRALIA. 1 specimen, AM W26755, Elliston Reef, 33°39'S 134°53'E, algae from reef flat at low tide, P.A. Hutchings, 11 Mar 1979. WESTERN AUSTRALIA. 1 specimen, AM W26513, Goss Passage, Beacon Island, 28°25.5'S 113°47.0'E, dead plates of *Acropora*, covered in coralline algae, 20 m, P.A. Hutchings, 20 May 1994. 1 specimen, AM W27046, Goss Passage, Beacon Island, 28°25.5'S 113°47.0'E, dead *Acropora* plates with sponges, ascidians & algae, 23 m, P.A. Hutchings, 19 May 1994. 1 specimen, AM W27047, Goss Passage, Beacon Island, 28°25.5'S 113°47.0'E, dead coral plates covered in coralline algae, 8 m, P.A. Hutchings, 22 May 1994. 1 specimen, AM W27048, north end of Long Island, 28°27.9'S 113°46.3'E, dead coral substrate covered in coralline & brown algae, 6 m, C. Bryce, 22 May 1994. 2 specimens, AM W27049, southeast end of Long Island, 28°28.8'S 113°46.5'E, dead coral embedded in calcareous substrate, 30 m, P.A. Hutchings, 22 May 1994. 1 specimen, AM W27050, Goss Passage, Beacon Island, 28°25.5'S 113°47.0'E, dead coral substrate embedded in fine sediment, 33 m, P.A. Hutchings, 23 May 1994. 1 specimen, AM W27051, off south end of Long Island, Beacon Island, 28°28.8'S 113°46.3'E, dead coral substrate covered in coralline algae, 5 m, P.A. Hutchings, 25 May 1994. 2 specimens, AM W27052, southwest corner of Lucas Island, 15°13'S 124°31'E, 30 m, P.A. Hutchings, 24 July 1988.

Description. Body small, about 1.8 mm long, 0.12 mm wide, 27 chaetigers. Prostomium oval; 4 small eyes in trapezoidal arrangement, and 2 small anterior eyespots; antennae inserted close to each other, on middle of prostomium (Fig. 71A); median antenna long, cylindrical, slightly longer than prostomium and palps together; lateral antennae shorter than prostomium, median antenna about 5 times as long as lateral antennae. Palps broad, completely fused along their length, longer than prostomium, forming a triangular piece (Fig. 71A). Peristomium similar in length to following segments; tentacular cirri papilliform, shorter than lateral antennae. Dorsal cirri papilliform, shorter than parapodial lobes, larger than tentacular cirri but shorter than lateral antennae, absent on chaetiger 2 (Fig. 71A). Anterior parapodia each with 2–3 compound chaetae with spiniger-like blades, indistinctly bidentate, distal tooth rounded and subdistal tooth small, marginal spines moderate and coarse (Fig. 71C), about 25 µm long, in addition 8 compound falcigers, with short blades, slight dorsoventral gradation, 12 µm above, 6 µm below, distinctly bidentate (Fig. 71D) and short marginal spines. Number of spiniger-like chaetae on each parapodium progressively decreasing posteriorly, absent from midbody; middle and posterior parapodia with compound heterogomph falcigers, 5 on posterior parapodia, distinctly bidentate, provided with short, fine marginal spines (Fig. 71G); blades of posterior parapodia about 13 µm above, 9 µm below. Dorsal simple chaetae from anterior parapodia, usually from chaetiger 1, distinctly bidentate, with short marginal spines (Fig. 71B), increasingly thicker

posteriorly (Fig. 71F). Ventral simple chaetae on posterior parapodia, sigmoid, smooth, distinctly bidentate (Fig. 71H). Solitary acicula, distally rounded (Fig. 71E). Pygidium bilobed, with 2 long anal cirri. Pharynx long, through about 5–6 segments, pharyngeal tooth near anterior rim (Fig. 71A). Proventricle though 3–4 segments, with about 15 muscle cell rows.

Remarks. *Exogone (P.) acutipalpa* Kudenov & Harris, 1995 is similar, but it has unidentate dorsal simple chaetae, the long-bladed compound chaetae with proportionally longer blades, and the blades diminishing progressively in length on the parapodia (Kudenov & Harris, 1995).

Distribution. Western Mediterranean. Australia (Western Australia, New South Wales, Queensland).

Habitat. Seagrass, algae, dead coral, sand, intertidal to about 30 m depth.

Exogone (Parexogone) caribensis San Martín, 1991

Fig. 72A–I

Exogone (Parexogone) caribensis San Martín, 1991a: 725, fig. 5; San Martín *et al.*, 1996: 251, fig. 2; San Martín, 2003: 248, figs. 134, 135.

Material examined. AUSTRALIA: QUEENSLAND. 1 specimen, AM W27014, 100 m off Mangrove Beach in lagoon, Lizard Island, 14°40'S 145°28'E, coarse to medium sand, 3 m, A. Jones & C. Short, 13 Oct 1978. 1 specimen, AM W27015, inside lagoon entrance, Lizard Island, 14°40'S 145°28'E, medium to fine sand, 18 m, A. Jones & C. Short, 9 Oct 1978. TASMANIA. 3 specimens, AM W27673, near freshwater stream, Parsons Cove, Freycinet National Park, 42°08.6'S 148°16.9'E, clean gravelly sand, intertidal, 0 m, N.W. Riser, 24 Jan 1986. WESTERN AUSTRALIA. 1 specimen, AM W26796, southeast end of Long Island, 28°28.8'S 113°46.5'E, dead coral substrate embedded in calcareous substrate, 30 m, P.A. Hutchings, 22 May 1994. 3 specimens, AM W27012, southeast end of Long Island, 28°28.8'S 113°46.5'E, dead coral embedded in calcareous substrate, 30 m, P.A. Hutchings, 22 May 1994. 3 specimens, AM W27013, Wallabi Island group, 28°27.05'S 113°45.10'E, scallop beds medium to fine sand with shell debris, 38 m, P.A. Hutchings on FRV "Flinders", 30 May 1994. 1 specimen, AM W27442, north end of beach, Bundegi Reef, Exmouth Gulf, 21°49'S 114°11'E, rocky rubble, coralline algae with green epiphyte, 2 m, H.E. Stoddart, 4 Jan 1984.

Description. Body small, thin, about 3.6 mm long, 0.24 mm wide, 37 chaetigers. Prostomium ovate to rectangular, wider than long; 4 small eyes in trapezoidal arrangement and 2 anterior eyespots (Fig. 72A); antennae inserted close to each other, between posterior eyes; median antenna cylindrical, much longer than lateral antennae, shorter than combined length of prostomium and palps; lateral antennae minute, papilliform. Palps long, broad, fused along their length, slightly longer than prostomium (Fig. 72A). Tentacular and dorsal cirri minute, papilliform; dorsal cirri absent on chaetiger 2 (Fig. 72A). Anterior parapodia each with 1–2 compound chaetae with blades long, distally rounded unidentate or provided with minute subdistal tooth, and short, coarse marginal spines (Fig. 72C), about 25 µm long; in addition 10–12 compound chaetae with short blades, unidentate or sub-bidentate, margin coarsely serrated (Fig. 72D), 9 µm long. Blades of spiniger-like chaetae slightly longer (Fig. 72G) on midbody, about 36 µm long, falcigers similar (Fig. 72H); midbody parapodia each with solitary spiniger-like chaeta and 4–5 falcigers; posterior parapodia each with only 3–4 falcigers. Dorsal simple chaetae from

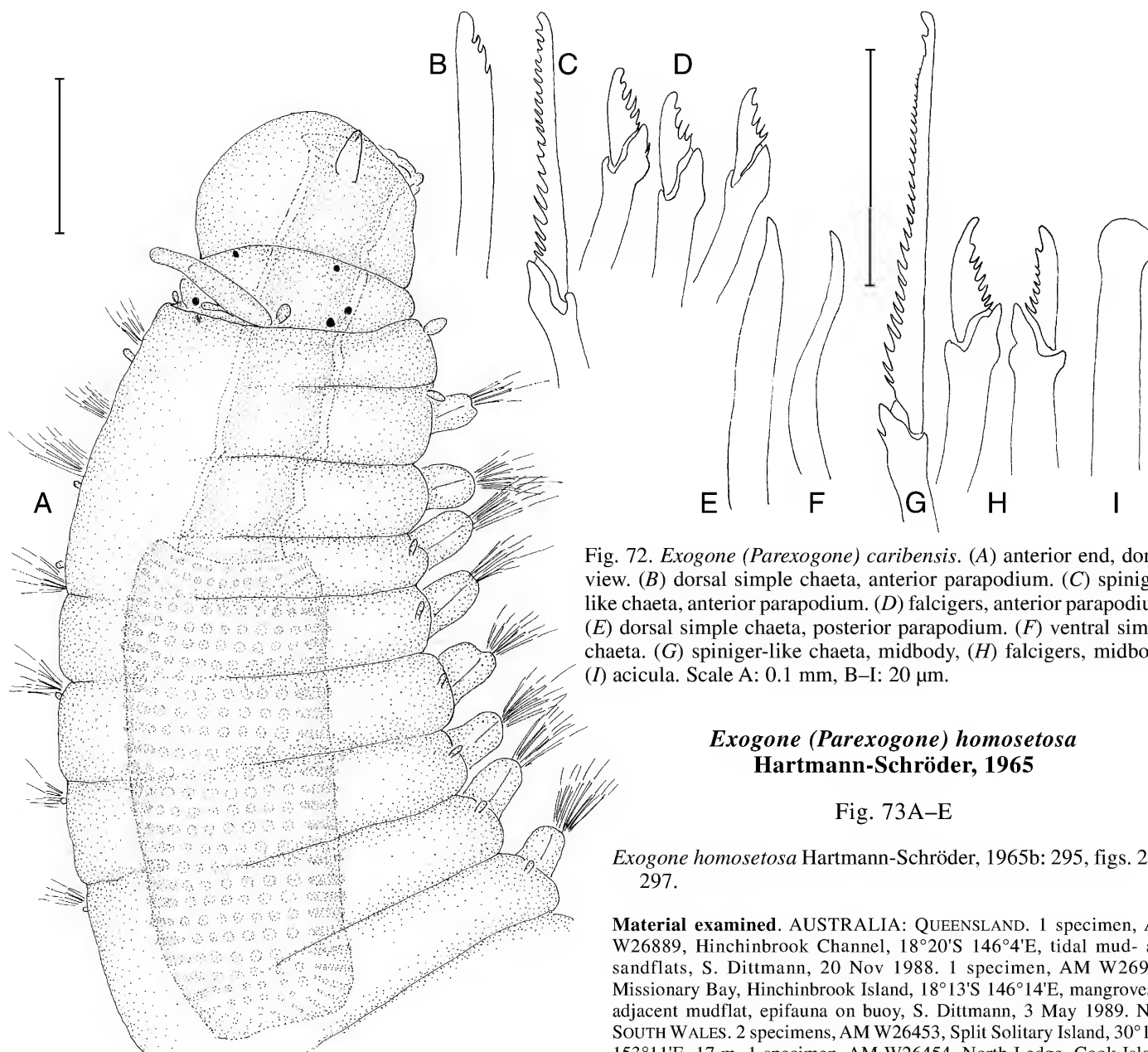


Fig. 72. *Exogone (Parexogone) caribensis*. (A) anterior end, dorsal view. (B) dorsal simple chaeta, anterior parapodium. (C) spiniger-like chaeta, anterior parapodium. (D) falcigers, anterior parapodium. (E) dorsal simple chaeta, posterior parapodium. (F) ventral simple chaeta. (G) spiniger-like chaeta, midbody, (H) falcigers, midbody, (I) acicula. Scale A: 0.1 mm, B–I: 20 μ m.

***Exogone (Parexogone) homosetosa*
Hartmann-Schröder, 1965**

Fig. 73A–E

Exogone homosetosa Hartmann-Schröder, 1965b: 295, figs. 296, 297.

Material examined. AUSTRALIA: QUEENSLAND. 1 specimen, AM W26889, Hinchinbrook Channel, 18°20'S 146°4'E, tidal mud- and sandflats, S. Dittmann, 20 Nov 1988. 1 specimen, AM W26930, Missionary Bay, Hinchinbrook Island, 18°13'S 146°14'E, mangroves & adjacent mudflat, epifauna on buoy, S. Dittmann, 3 May 1989. NEW SOUTH WALES. 2 specimens, AM W26453, Split Solitary Island, 30°15'S 153°11'E, 17 m. 1 specimen, AM W26454, North Ledge, Cook Island, 28°11.44'S 153°34.67'E, sponge, 10 m, A.R. Parker, 08 Jun 1993. WESTERN AUSTRALIA. 1 specimen, AM W27085, Goss Passage, Beacon Island, 28°25.5'S 113°47.0'E, dead *Acropora* plates with sponges, ascidians & algae, 32 m, P.A. Hutchings, 19 May 1994. 1 specimen, AM W27086, Goss Passage, Beacon Island, 28°25.5'S 113°47.0'E, dead *Acropora* plates covered in coralline algae, 8 m, P.A. Hutchings, 19 May 1994. 1 specimen, AM W27087, Goss Passage, Beacon Island, 28°25.5'S 113°47.0'E, dead coral plates covered in coralline algae, 8 m, P.A. Hutchings, 22 May 1994. 2 specimens, AM W27088, southeast end of Long Island, 28°28.8'S 113°46.5'E, dead coral embedded in calcareous substrate, 30 m, P.A. Hutchings, 22 May 1994. 1 specimen, AM W27089, northeast entrance to Goss Passage, Beacon Island, 28°27.9'S 113°46.7'E, dead branching *Acropora* with coralline & brown algae, 24 m, P.A. Hutchings, 25 May 1994.

Description. Body slightly elongate, but proportionally shorter than other species, 3.5 mm long, 0.16 mm wide, 40 chaetigers. Prostomium ovate, wider than long; 4 eyes in rectangular arrangement, small in immature specimens, large and close to each other on each side in mature ones (Fig. 73A), and 2 anterior eyespots. Antennae inserted close to each other, just in front of anterior eyes or between them; median antenna elongate, cylindrical, shorter than combined length of half of prostomium and palps; lateral antennae about $\frac{1}{3}$ of length of median antenna, ovate (Fig. 73A). Palps long, triangular, completely fused along their length,

anterior parapodia, unidentate, subdistally serrated (Fig. 72B), thicker and smooth on posterior parapodia (Fig. 72E). Ventral simple chaetae on posterior parapodia, sigmoid, unidentate, smooth (Fig. 72F). Acicula solitary, distally expanded and rounded (Fig. 72I). Pharynx long, through about 4–5 segments; pharyngeal tooth conical, on anterior rim (Fig. 72A). Proventricle slightly shorter than pharynx, through 5–6 segments, with about 23 muscle cell rows. Pygidium with 2 long anal cirri.

Distribution. USA (Florida and Gulf of México). Capbreton Canyon (between Spain and France). Eastern Mediterranean. Australia (Queensland, Tasmania, Western Australia).

Habitat. Sandy sediments, from shallow waters to 1,100 m depth; occasionally young specimens on algae.

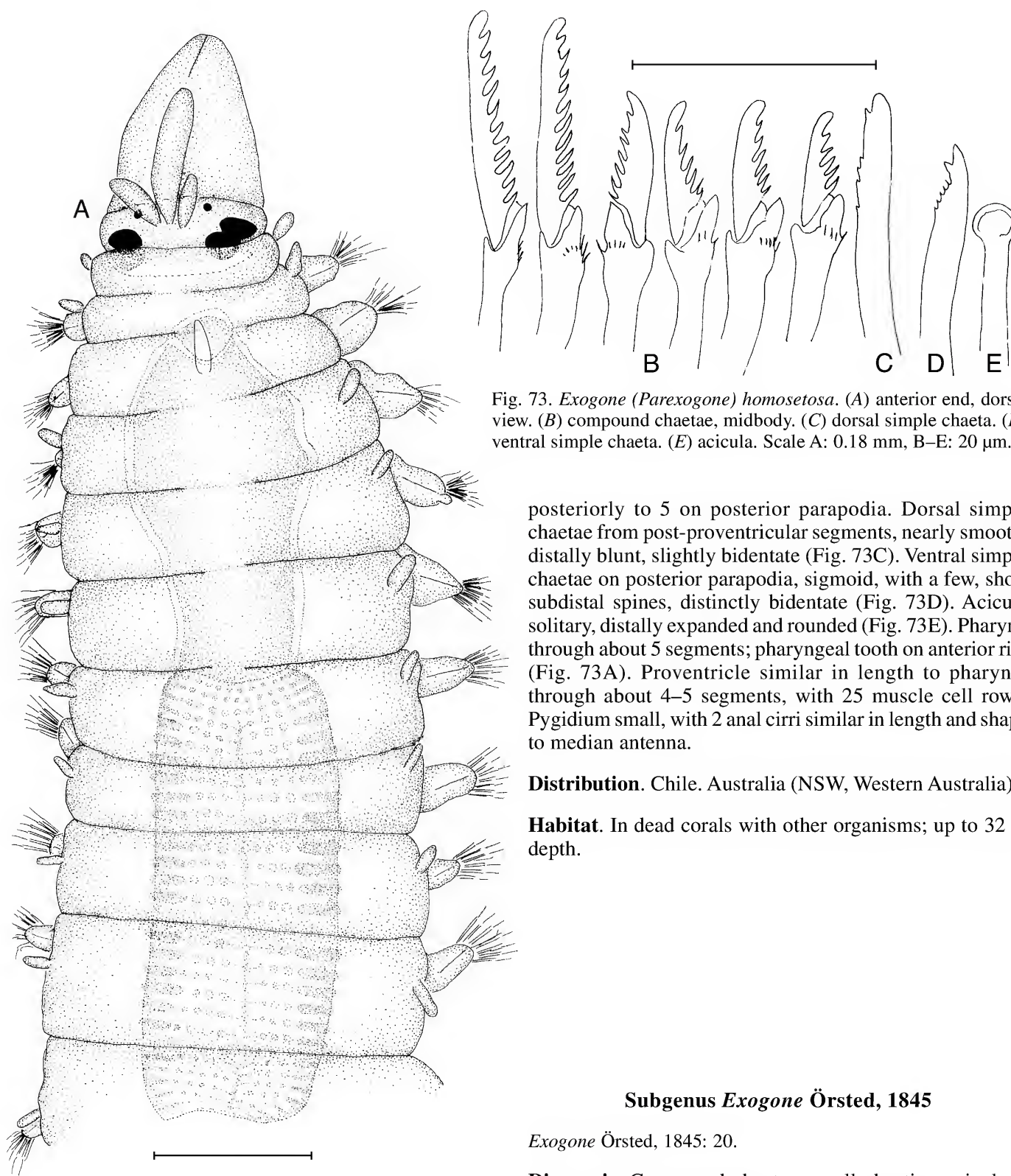


Fig. 73. *Exogone* (*Parexogone*) *homosetosa*. (A) anterior end, dorsal view. (B) compound chaetae, midbody. (C) dorsal simple chaeta. (D) ventral simple chaeta. (E) acicula. Scale A: 0.18 mm, B–E: 20 μ m.

posteriorly to 5 on posterior parapodia. Dorsal simple chaetae from post-proventricular segments, nearly smooth, distally blunt, slightly bidentate (Fig. 73C). Ventral simple chaetae on posterior parapodia, sigmoid, with a few, short subdistal spines, distinctly bidentate (Fig. 73D). Acicula solitary, distally expanded and rounded (Fig. 73E). Pharynx through about 5 segments; pharyngeal tooth on anterior rim (Fig. 73A). Proventricle similar in length to pharynx, through about 4–5 segments, with 25 muscle cell rows. Pygidium small, with 2 anal cirri similar in length and shape to median antenna.

Distribution. Chile. Australia (NSW, Western Australia).

Habitat. In dead corals with other organisms; up to 32 m depth.

Subgenus *Exogone* Örsted, 1845

Exogone Örsted, 1845: 20.

Diagnosis. Compound chaetae on all chaetigers, include both spiniger-like chaetae with fine, long, filiform, usually bifid blades and falcigers with short, bidentate blades, subdistal tooth much longer than distal tooth, shafts tips usually complex and spinose; sometimes spiniger-like chaetae of anteriormost parapodia may be absent; occasionally blades of spiniger-like chaetae modified. Tips of dorsal simple chaetae of anterior chaetigers finely spinulose subterminally and with rounded tip; dorsal simple chaetae progressively increasing in thickness posteriorly and changing slightly in shape. Antennae reduced or absent in some species.

Type species. *Exogone naidina* Örsted, 1845.

with a slight dorsal furrow (Fig. 73A). Peristomium slightly shorter than following segments, covering dorsally posterior part of prostomium; tentacular cirri small, papilliform, smaller than lateral antennae. Dorsal cirri papilliform, smaller than lateral antennae but larger than tentacular cirri, absent on chaetiger 2, shorter than parapodial lobes (Fig. 73A). Compound chaetae heterogomph, shafts with small subdistal spines, similar throughout, blades bidentate, with small subdistal tooth and moderate, coarse marginal spines, 1–2 with longer blades (20 μ m) and remaining shorter, (13–10 μ m) (Fig. 73B); anterior parapodia each with about 12 compound chaetae, numbers diminishing progressively

Key to the species of *Exogone* (*Exogone*) recorded from Australia

- 1 Shafts of spiniger-like compound chaetae distally enlarged,
 spinose; blades of these chaetae relatively short, triangular 2
- Shafts not enlarged; blades of spiniger-like compound chaetae
 thin, slender, filiform 3
- 2 Antennae inserted near posterior margin of prostomium; median
 antenna longer than combined length of prostomium and palps,
 spindle-shaped *E. (E.) heterosetosa*
- Antennae inserted near anterior margin of prostomium; median
 antenna shorter than combined length of prostomium and palps
 together, bowling-pin shaped *E. (E.) heterosetoides*
- 3 Shafts of spiniger-like compound chaetae of one of the
 anteriormost parapodia enlarged, provided with a triangular
 process 4
- Shafts of spiniger-like compound chaetae similar throughout 5
- 4 Chaetae with modified shafts on chaetiger 1 *E. (E.) longicornis*
- Chaetae with modified shafts on chaetiger 2 *E. (E.) lourei*
- 5 Anteriormost parapodia without spiniger-like compound chaetae 6
- Spiniger-like compound chaetae from chaetiger 1 8
- 6 Without dorsal cirri on chaetiger 2. Compound chaetae on
 anteriormost parapodia uniformly short with deeply bifid blades *E. (E.) naidina*
- Dorsal cirri present on chaetiger 2. Blades of falcigers of anterior
 parapodia similar to those of remaining segments 7
- 7 Antennae inserted on anterior margin of prostomium. Pharynx
 and proventricle short (through about 2 segments each). Shafts of
 anterior and midbody compound chaetae with long, fine spines *E. (E.) goorapuranga* n.sp.
- Antennae inserted on middle of prostomium. Pharynx and
 proventricle longer (through more than 2 segments each). Spines
 of shafts of compound chaetae moderately long *E. (E.) arrakatarkoola* n.sp.
- 8 Dorsal simple chaetae provided with long, fine spines (aristae) 9
- Dorsal simple chaetae without aristae 10
- 9 All antennae short. Blades of some falcigers on midbody and
 posterior segments strongly modified. Ventral simple chaetae
 without aristae *E. (E.) ingridae* n.sp.
- Median antenna long, similar in length to prostomium and palps
 together. Without strongly modified falcigerous blades. Ventral
 simple chaetae with aristae *E. (E.) aristata*
- 10 Median antenna distinctly longer than lateral antennae *E. (E.) dispar*
- Median antenna small, slightly longer than lateral antennae 11
- 11 Dorsal simple chaetae distinctly bidentate, with both teeth similar *E. (E.) haswelli* n.sp.
- Dorsal simple chaetae unidentate or indistinctly bidentate, with
 distal tooth reduced 12
- 12 Antennae inserted on anterior margin of prostomium. Proventricle
 short (through about 1–2 segments). Shafts of compound chaetae
 of midbody provided with a distinct, long spine *E. (E.) koorenborongi* n.sp.
- Antennae inserted between eyes, on middle of prostomium. Shafts
 without long spines 13

- 13 Median antenna pyriform. Blades of falcigers short, encased in shafts *E. (E.) brevifalcigera*
- Median antenna ovate. Blades projecting distinctly beyond the shafts 14
- 14 Body slender, filiform. Proventricle short (through about 2 segments) *E. (E.) breviantennata*
- Body broad. Proventricle long, through more than 2 segments *E. (E.) africana*

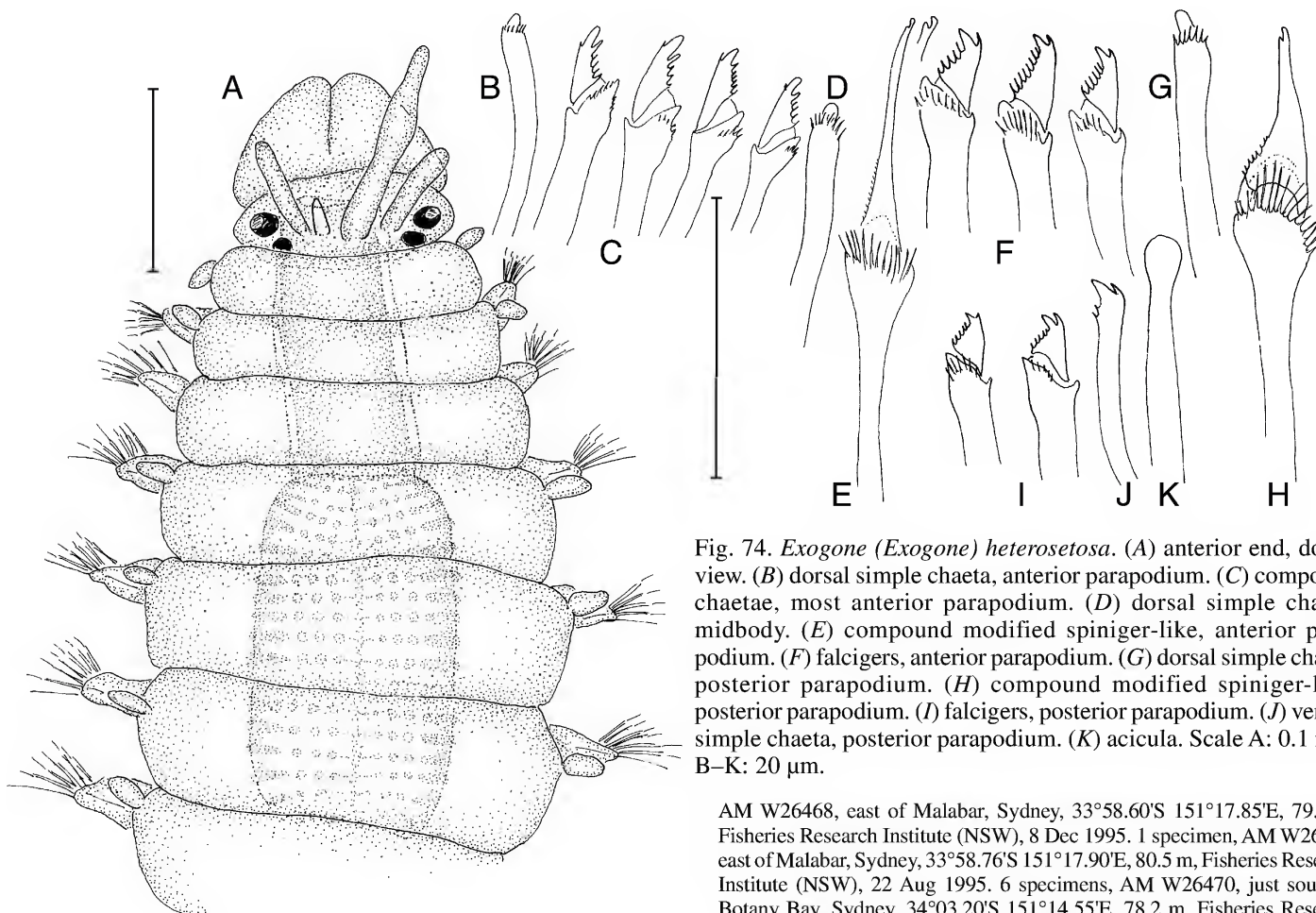


Fig. 74. *Exogone (Exogone) heterosetosa*. (A) anterior end, dorsal view. (B) dorsal simple chaeta, anterior parapodium. (C) compound chaetae, most anterior parapodium. (D) dorsal simple chaeta, midbody. (E) compound modified spiniger-like, anterior parapodium. (F) falcigers, anterior parapodium. (G) dorsal simple chaeta, posterior parapodium. (H) compound modified spiniger-like, posterior parapodium. (I) falcigers, posterior parapodium. (J) ventral simple chaeta, posterior parapodium. (K) acicula. Scale A: 0.1 mm, B–K: 20 µm.

***Exogone (Exogone) heterosetosa* McIntosh, 1885**

Fig. 74A–K

Exogone heterosetosa McIntosh, 1885: 205, pl. 33, figs. 15–16, pl. 34A, fig. 11; Haswell, 1920a: 221, figs. 11–17; Hutchings & Murray, 1984: 32; Blankenstein & Lana (1986): 63.

Exogone heterochaeta Ehlers, 1897: 51, pl. 31. Augener, 1913: 247; 1927: 156.

?*Exogone heterosetoides australis* Hartmann-Schröder & Rosenfeldt, 1988: 44, fig. 23; Hartmann-Schröder, 1989: 30; 1990: 55; San Martín & Parapar, 1997: 291.

Exogone heterosetoides.—Hartmann-Schröder, 1987: 42, figs. 17–19. Not Hartmann-Schröder, 1979.

Material examined. AUSTRALIA: QUEENSLAND. 1 specimen, AM W26582, Halifax Bay, north of Townsville, 19°09'S 146°37'E, 2 m, Queensland Nickel Pty Ltd, Feb 1985. NEW SOUTH WALES. 3 specimens, AM W23537, Weeney Bay, Botany Bay, 34°01.3'S 151°09.7'E, mud, 1 m, A. Roach & A. Jones, 30 Mar 1995. 1 specimen, AM W23904, Pittwater, 33°35.79'S 151°18.30'E, sand, 14.8 m, Australian Museum Party, 3 Jun 1994. 1 specimen, AM W26430, 100 m northwest of Split Solitary Island, 30°14.0'S 153°10.8'E, mixed red algae, 15 m, S.J. Keable, 7 Mar 1992. 2 specimens, AM W26431, Manta Reef, North West Solitary Island, 30°01.5'S 153°16.5'E, lace bryozoan, 19 m, R.T. Springthorpe, 25 Jun 1992. 6 specimens, AM W26432, southwest side of South Solitary Island, 30°12.0'S 153°16.0'E, coral rubble, 18 m, R.T. Springthorpe, 24 Jun 1992. 1 specimen,

AM W26468, east of Malabar, Sydney, 33°58.60'S 151°17.85'E, 79.8 m, Fisheries Research Institute (NSW), 8 Dec 1995. 1 specimen, AM W26469, east of Malabar, Sydney, 33°58.76'S 151°17.90'E, 80.5 m, Fisheries Research Institute (NSW), 22 Aug 1995. 6 specimens, AM W26470, just south of Botany Bay, Sydney, 34°03.20'S 151°14.55'E, 78.2 m, Fisheries Research Institute (NSW), 21 Jun 1996. 2 specimens, AM W26471, east of Malabar, Sydney, 33°58.72'S 151°17.95'E, 81.9 m, Fisheries Research Institute (NSW), 22 Aug 1995. 1 specimen, AM W26472, east of Malabar, Sydney, 33°58.72'S 151°18.00'E, 82 m, Fisheries Research Institute (NSW), 22 Aug 1995. 1 specimen, AM W26473, east of Malabar, Sydney, 33°58.76'S 151°18.00'E, 82.6 m, Fisheries Research Institute (NSW), 22 Aug 1995. 1 specimen, AM W26474, east of Malabar, Sydney, 33°58.60'S 151°18.00'E, 81.6 m, Fisheries Research Institute (NSW), 15 Nov 1995. 1 specimen, AM W26475, east of Malabar, Sydney, 33°58.60'S 151°17.95'E, 81.5 m, Fisheries Research Institute (NSW), 19 Dec 1995. 1 specimen, AM W26530, South Ledge, Cook Island, 28°11.65'S 153°34.63'E, purple finger sponge, 12 m, A.R. Parker, 9 Jun 1993. 4 specimens, AM W26531, 100 m north west of Julian Rocks, Byron Bay, 28°36.8'S 153°37.8'E, shell and gravel, 15 m, E.L. Albertson *et al.*, 3 Mar 1992. 14 specimens, AM W26614, north east corner of Clark Island, 33°51.85'S 151°14.47'E, encrustation on outside of bottle, 5 m, P.A. Hutchings, 17 Apr 1996. 3 specimens, AM W26636, Grotto Point, Port Jackson, 33°49'S 151°15'E, algae, 4 m, P. Colman, 18 July 1983. 10 specimens, AM W26638, Crowdy Head, 31°50'S 152°45'E, brown algae in rock pools, J.K. Lowry, 13 Jan 1982. 2 specimens, AM W26641, north east corner of Clark Island, 33°51.85'S 151°14.47'E, 5 m, P.A. Hutchings, 17 Apr 1996. 14 specimens, AM W26656, north east corner of Clark Island, 33°51.85'S 151°14.47'E, encrustation on outside of bottle, 5 m, P.A. Hutchings, 17 Apr 1996. 3 specimens, AM W26729, mid point of Aislings Beach, Twofold Bay, 37°05'S 149°56'E, benthic, 32.9 m, S. Keable & P. Albertson, 21 Feb 1985. 1 specimen, AM W26730, Carama Inlet, Jervis Bay, 35°0'S 150°46.5'E, *Zostera capricorni*, L. Howitt, Mar 1989. 2 specimens, AM W26731, 100 m north west of Split Solitary Island, 30°14.0'S 153°10.8'E, gravel under rocks, 15 m, R. Gentle, Solitary Is. Underwater Research Group, 7 Mar 1992. 1 specimen, AM W26794, 100 m north west

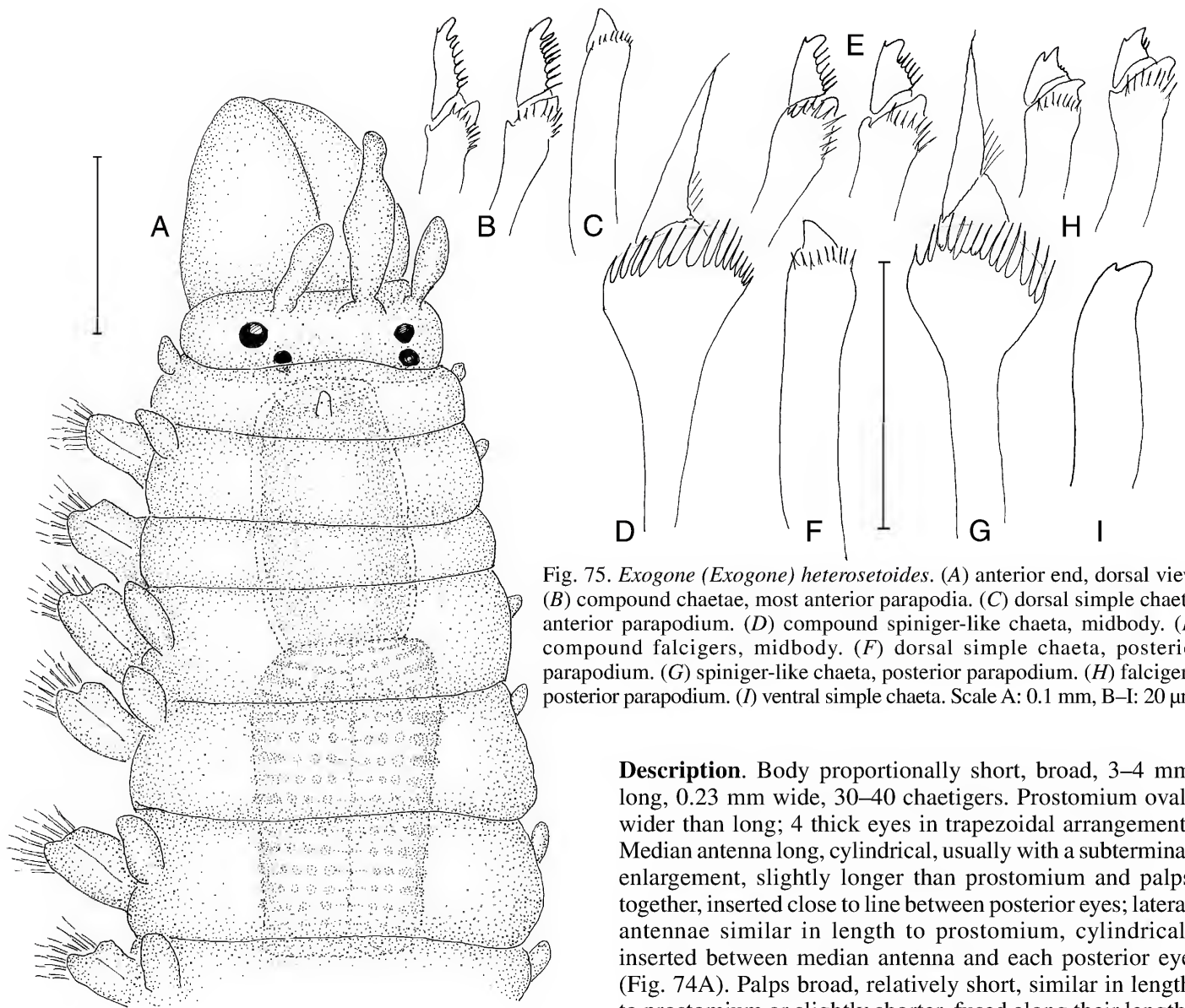


Fig. 75. *Exogone (Exogone) heterosetoides*. (A) anterior end, dorsal view. (B) compound chaetae, most anterior parapodia. (C) dorsal simple chaeta, anterior parapodium. (D) compound spiniger-like chaeta, midbody. (E) compound falcigers, midbody. (F) dorsal simple chaeta, posterior parapodium. (G) spiniger-like chaeta, posterior parapodium. (H) falcigers, posterior parapodium. (I) ventral simple chaeta. Scale A: 0.1 mm, B–I: 20 µm.

of Split Solitary Island, 30°14'S 153°10.8'E, encrusting algae and ascidians, 16 m, E.L. Albertson, 7 Mar 1992. 1 specimen, AM W27462, small bay in Cowan Creek, Hawkesbury River, 33°39.0'S 151°09.5'E, 7.5 m, A. Jones *et al.*, 04 Oct 1980. 1 specimen, AM W196624, Waratah Bay, Cowan Creek, 33°37.8'S 151°09.9'E, 4.5 m, A. Jones *et al.*, 3 Oct 1980. SOUTH AUSTRALIA. 1 specimen, AM W26759, Victor Harbour, 35°33'S 138°38'E, *Zostera* washings, P.A. Hutchings, 16 Mar 1979. 1 specimen, AM W26760, Billy Lights Point, Port Lincoln, 34°45'S 135°53'E, stone washings from sheltered intertidal rocks, 0 m, I. Loch, 15 Feb 1985. 4 specimens, AM W26761, Elliston Reef, 33°39'S 134°53'E, algae from reef flat at low tide, P.A. Hutchings, 11 Mar 1979. 1 specimen, AM W26762, Maston Point, American River, Kangaroo Island, 35°47'S 137°46'E, clumps of sponge in channel below wharf, 5 m, P.A. Hutchings, 02 Mar 1979. WESTERN AUSTRALIA. 1 specimen, AM W26823, Red Bluff, Kalbarri, 27°42'S 114°09'E, brown alga from surf zone on rocky shore, 0.5 m, H.E. Stoddart, 9 Jan 1984. 1 specimen, AM W27056, Goss Passage, Beacon Island, 28°25.5'S 113°47.0'E, dead *Acropora* plates with sponges, ascidians & algae, 23 m, P.A. Hutchings, 19 May 1994. 10 specimens, AM W27057, north end of Long Island, Goss Passage, 28°28.3'S 113°46.3'E, dead coral covered with coralline algae & boring bivalves, 8 m, C. Bryce, 22 May 1994. 3 specimens, AM W27058, off jetty near Fisheries Hut, Beacon Island, 28°25.5'S 113°47.0'E, dead plate coral substrate—*Acropora*, *Montipora* spp., 12 m, P.A. Hutchings, 23 May 1994. 1 specimen, AM W27059, northeast entrance to Goss Passage, Beacon Island, 28°27.8'S 113°46.7'E, dead branching *Acropora* substrate covered with algae, 24 m, P.A. Hutchings, 25 May 1994. 2 specimens, AM W27060, off south end of Long Island, Beacon Island, 28°28.8'S 113°46.3'E, dead coral substrate covered in coralline algae, 5 m, P.A. Hutchings, 25 May 1994. 1 specimen on SEM stub, AM W27678, west of Penguin Island, Warnbro Sound, 32°20'S 115°43'E, dead reef sponges, 5 m, P.A. Hutchings, 21 Mar 1993.

Description. Body proportionally short, broad, 3–4 mm long, 0.23 mm wide, 30–40 chaetigers. Prostomium oval, wider than long; 4 thick eyes in trapezoidal arrangement. Median antenna long, cylindrical, usually with a subterminal enlargement, slightly longer than prostomium and palps together, inserted close to line between posterior eyes; lateral antennae similar in length to prostomium, cylindrical, inserted between median antenna and each posterior eye (Fig. 74A). Palps broad, relatively short, similar in length to prostomium or slightly shorter, fused along their length, with a dorsal furrow and a distal notch (Fig. 74A). Peristomium similar in length to following segments; tentacular cirri ovoid, much shorter than lateral antennae. Dorsal cirri similar to tentacular cirri, slightly longer, absent on chaetiger 2 (Fig. 74A), shorter than parapodial lobes. Most anterior parapodia each with about 5–7 compound chaetae, all compound chaetae heterogomph falcigers, with long subdistal teeth and small, indistinct distal teeth, and short marginal spines (Fig. 74C), about 6–7 µm long; from about chaetiger 4–5 parapodia with 4–6 similar compound falcigers (Fig. 74F) and solitary strongly modified spiniger-like, distally spinose on shaft, and blade triangular, large on bases, proportionally short, about 15–16 µm long, distally minutely bidentate (Fig. 74E); from midbody posteriorly spiniger-like chaetae with shorter, more strongly triangular blades (Fig. 74H), indistinctly bidentate, about 14 µm long, in addition 3–4 falcigers with short blades (Fig. 74I), about 4–5 µm long. Dorsal simple chaetae from anterior parapodia, with rounded tips and finely spinulose subterminally, thicker posteriorly (Figs. 74B,D,G). Ventral simple chaetae on posterior parapodia, sigmoid, nearly smooth, with long subdistal tooth and short, small distal tooth (Fig. 74J). Acicula solitary, distally rounded (Fig. 74K). Pharynx through 4 segments; pharyngeal tooth on anterior rim (Fig. 74A). Proventricle through 3 segments, with about 20 muscle cell rows.

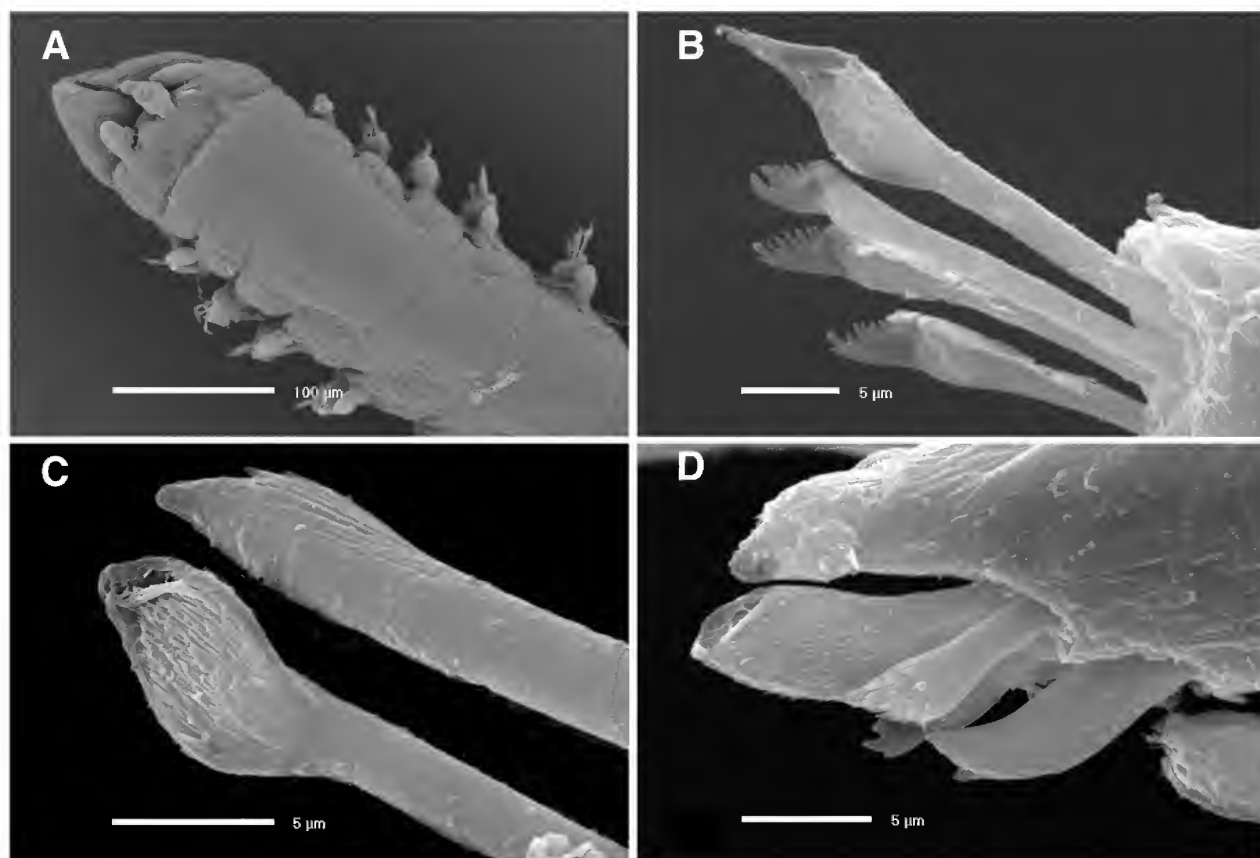


Fig. 76. SEM of *Exogone (Exogone) heterosetoides*. (A) anterior end, dorsal view. (B) compound chaetae, midbody. (C) dorsal simple chaeta and shaft of spiniger-like chaeta. (D) chaetal bundle, posterior parapodium.

Remarks. The Australian specimens agree with Haswell's (1920a) description of *E. heterosetosa*; the original description did not specify the length of the median antenna, because "the state of the preparation renders its presence doubtful" (McIntosh, 1885); subsequent descriptions of the species, however, show a long median antenna.

Distribution. Subantarctic seas. Australia (New South Wales, South Australia, Tasmania, Victoria, Western Australia, Queensland).

Habitat. All substrates: mud, sand, gravel, dead corals, algae, sponges. From shallow waters to about 600 m depth.

Exogone (Exogone) heterosetoides
Hartmann-Schröder, 1979

Figs. 75A–I, 76A–D

Exogone heterosetoides Hartmann-Schröder, 1979: 110, figs. 171–174. Not *Exogone heterosetoides* Hartmann-Schröder, 1987: 42, figs. 17–19.

Material examined. AUSTRALIA: NEW SOUTH WALES. 8 specimens, AM W26374, south of Worang Point, Twofold Bay, 37°03.5'S 149°56.5'E, benthic sediment, 6.1 m, S. Keable & P. Albertson, 21 Feb 1985. 3 specimens, AM W26375, east of Lookout Point, Twofold Bay, 37°5'S 149°56'E, benthic sample, 27.4 m, S. Keable & P. Albertson, 21 Feb 1985. 2 specimens, AM W26376, 100 m north west of Split Solitary Island, 30°14.0'S 153°10.8'E, gravel under rocks, 17 m, R. Gentle, Solitary Islands Underwater Research Group, 7 Mar 1992. 1 specimen, AM W26377, Split Solitary Island, 30°15'S 153°11'E, 17 m. 1 specimen, AM W26537, southwest side of South Solitary Island, 30°12.0'S 153°16.0'E, coral rubble, 18 m, R.T. Springthorpe, 24 Jun 1992. 1 specimen, AM W26547, southwest side of South Solitary Island, 30°12.0'S 153°16.0'E, coral rubble, 18 m, R.T. Springthorpe, 24 Jun 1992. 1 specimen, AM W26643, Bottle and Glass Rocks, Port Jackson,

33°50.9'S 151°16.2'E, airlift, 12 m, G. Clark, 11 Dec 1989. 1 specimen, AM W26653, Barrenjoey Head, Broken Bay, 33°35'S 151°20'E, algae on rocky substrate, 5 m, J.K. Lowry *et al.*, 22 Apr 1983. 1 specimen, AM W26728, north of Honeysuckle Point, Twofold Bay, 37°5'S 149°56'E, benthic sample, 31.1 m, S. Keable, P. Albertson, 21 Feb 1985. 2 specimens, AM W26732, Murrays Beach, Jervis Bay, ACT, 35°07.5'S 150°45.5'E, 9 m, P.A. Hutchings, 23 Jan 1973. SOUTH AUSTRALIA. 1 specimen, AM W26757, Victor Harbour, 35°33'S 138°38'E, algae, P.A. Hutchings, 16 Mar 1979. 1 specimen, AM W26758, Sleaford Bay, Port Lincoln, 34°54'S 135°47'E, algal washings, P.A. Hutchings, 10 Mar 1979. WESTERN AUSTRALIA. 1 specimen, AM W26825, outer edge of Ningaloo Reef off Ned's Camp, Cape Range National Park, 21°59'S 113°54.5'E, coral rubble, brown alga, 12 m, J.K. Lowry, 2 Jan 1984. 1 specimen, AM W26831, Bundegi Reef, near Point Murat, Exmouth Gulf, 21°49'S 113°11'E, small octocorals, 9 m, R.T. Springthorpe, 4 Jan 1984. 9 specimens, AM W27061, Goss Passage, Beacon Island, 28°25.5'S 113°47.0'E, dead *Acropora* with sponges, ascidians, coralline algae, 32 m, P.A. Hutchings, 19 May 1994. 6 specimens, AM W27062, Goss Passage, Beacon Island, 28°25.5'S 113°47.0'E, dead *Acropora* plates with sponges, ascidians & algae, 23 m, P.A. Hutchings, 19 May 1994. 3 specimens, AM W27063, Goss Passage, Beacon Island, 28°25.5'S 113°47.0'E, dead *Acropora* plates covered in coralline algae, 8 m, P.A. Hutchings, 19 May 1994. 10 specimens, AM W27064, Goss Passage, Beacon Island, 28°25.5'S 113°47.0'E, dead *Acropora* plates covered in coralline algae, 20 m, P.A. Hutchings, 20 May 1994. 1 specimen, AM W27065, Goss Passage, Beacon Island, 28°25.5'S 113°47.0'E, dead *Acropora* plates covered in coralline algae & sponges, 24 m, P.A. Hutchings, 21 May 1994. 2 specimens, AM W27066, Goss Passage, Beacon Island, 28°25.5'S 113°47.0'E, dead coral plates covered in coralline algae, 8 m, P.A. Hutchings, 22 May 1994. 5 specimens, AM W27067, north end of Long Island, 28°27.9'S 113°46.3'E, dead coral substrate with coralline & brown algae, 6 m, C. Bryce, 22 May 1994. 4 specimens, AM W27068, southeast end of Long Island, 28°28.8'S 113°46.5'E, dead coral embedded in calcareous substrate, 30 m, P.A. Hutchings, 22 May 1994. 2 specimens, AM W27069, southeast end of Long Island, 28°28.8'S 113°46.5'E, dead coral substrate with coralline algae, 8 m, P.A. Hutchings, 22 May 1994. 12 specimens, AM W27070, Goss Passage, Beacon Island, 28°25.5'S 113°47.0'E, dead coral substrate embedded in fine sediment, 33 m, P.A. Hutchings, 23 May 1994. 2 specimens, AM W27071, off jetty near Fisheries Hut, Beacon Island,

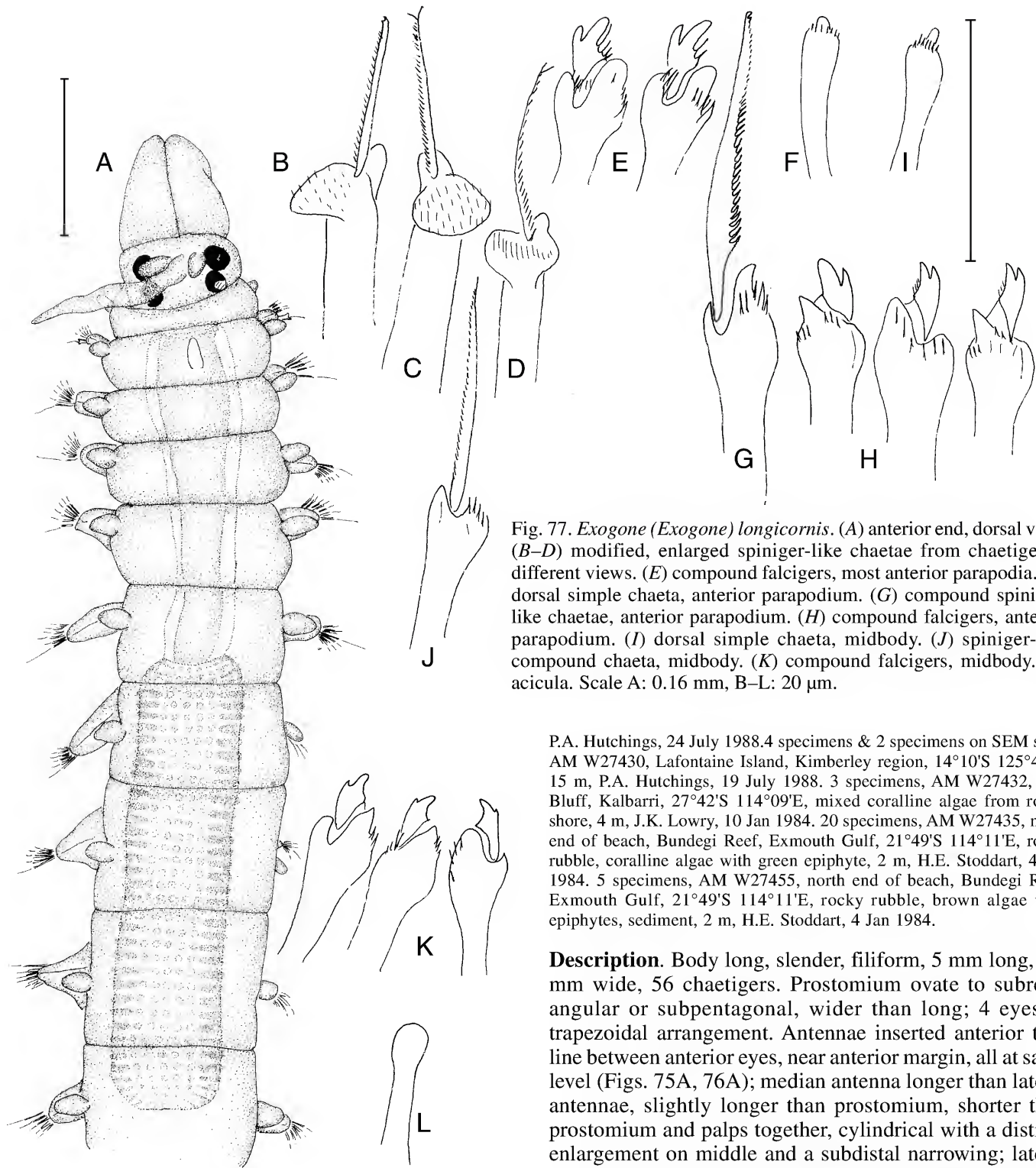


Fig. 77. *Exogone (Exogone) longicornis*. (A) anterior end, dorsal view. (B–D) modified, enlarged spiniger-like chaetae from chaetiger 1, different views. (E) compound falcigers, most anterior parapodia. (F) dorsal simple chaeta, anterior parapodium. (G) compound spiniger-like chaetae, anterior parapodium. (H) compound falcigers, anterior parapodium. (I) dorsal simple chaeta, midbody. (J) spiniger-like compound chaeta, midbody. (K) compound falcigers, midbody. (L) acicula. Scale A: 0.16 mm, B–L: 20 µm.

P.A. Hutchings, 24 July 1988. 4 specimens & 2 specimens on SEM stub, AM W27430, Lafontaine Island, Kimberley region, 14°10'S 125°47'E, 15 m, P.A. Hutchings, 19 July 1988. 3 specimens, AM W27432, Red Bluff, Kalbarri, 27°42'S 114°09'E, mixed coralline algae from rocky shore, 4 m, J.K. Lowry, 10 Jan 1984. 20 specimens, AM W27435, north end of beach, Bundegi Reef, Exmouth Gulf, 21°49'S 114°11'E, rocky rubble, coralline algae with green epiphyte, 2 m, H.E. Stoddart, 4 Jan 1984. 5 specimens, AM W27455, north end of beach, Bundegi Reef, Exmouth Gulf, 21°49'S 114°11'E, rocky rubble, brown algae with epiphytes, sediment, 2 m, H.E. Stoddart, 4 Jan 1984.

Description. Body long, slender, filiform, 5 mm long, 0.2 mm wide, 56 chaetigers. Prostomium ovate to subrectangular or subpentagonal, wider than long; 4 eyes in trapezoidal arrangement. Antennae inserted anterior to a line between anterior eyes, near anterior margin, all at same level (Figs. 75A, 76A); median antenna longer than lateral antennae, slightly longer than prostomium, shorter than prostomium and palps together, cylindrical with a distinct enlargement on middle and a subdistal narrowing; lateral antennae cylindrical, about $\frac{2}{3}$ of length of median antenna (Fig. 75A). Palps broad, longer than prostomium, fused along their length, with a distinct dorsal furrow (Figs. 75A, 76A). Peristomium similar in length to following segments; tentacular cirri ovoid, small. Dorsal cirri similar to tentacular cirri but longer, shorter than parapodial lobes, absent on chaetiger 2 (Figs. 75A, 76A). Anterior 5 parapodia each with about 5 compound falcigers, with spinose shafts and short, bidentate blades, subdistal tooth long and minute, indistinct distal tooth, with straight, moderate marginal spines (Fig. 75B), 6–7 µm long, without compound spiniger-like chaetae. From about chaetiger 6, parapodia each with solitary spiniger-like chaeta, shaft enlarged, distally expanded, with numerous long spines, and proportionally short, thin, unidentate, triangular blade, appearing like a

28°25.5'S 113°47.0'E, dead plate coral substrate—*Acropora*, *Montipora* spp., 12 m, P.A. Hutchings, 23 May 1994. 6 specimens, AM W27072, northeast entrance to Goss Passage, Beacon Island, 28°27.9'S 113°46.7'E, dead branching *Acropora* substrate covered with algae, 24 m, P.A. Hutchings, 25 May 1994. 11 specimens, AM W27073, northeast entrance to Goss Passage, Beacon Island, 28°27.9'S 113°46.7'E, dead plate-like *Acropora* covered with coralline algae, 8 m, P.A. Hutchings, 25 May 1994. 3 specimens, AM W27074, off south end of Long Island, Beacon Island, 28°28.8'S 113°46.3'E, dead coral substrate covered in coralline algae, 5 m, P.A. Hutchings, 25 May 1994. 2 specimens, AM W27075, Wallabi Island group, 28°34.65'S 113°46.46'E, coral rubble & sponges, 49 m, P.A. Hutchings on FRV "Flinders", 28 Jun 1994. 5 specimens, AM W27076, East Montlivet Island, 15°06'S 125°18'E, 6 m, P.A. Hutchings, 16 July 1988. 1 specimen, AM W27077, Long Reef, 13°58'S 125°38'E, 25 m, P.A. Hutchings, 17 July 1988. 11 specimens, AM W27078, southwest corner of Lucas Island, 15°13'S 124°31'E, 30 m,

long spine under low magnifications, provided with a few thin marginal spines (Figs. 75D, 76B,C); in addition 3 falcigers, similar to those of anteriormost parapodia but shorter (Figs. 75E, 76B), about 5–6 μm long; posterior parapodia each with solitary compound spiniger-like chaetae (Fig. 75G) similar to those of midbody segments; in addition 2 falcigers, with short blades (Figs. 75H, 76D), 4 μm long. Dorsal simple chaetae from chaetiger 1 or from an anteriormost parapodium, with rounded tips and finely spinulose subterminally (Figs. 75C, 76C), thicker posteriorly (Fig. 75F). Ventral simple chaetae on posterior parapodia, thick, sigmoid, smooth, bidentate, with small distal tooth and large subdistal tooth (Figs. 75I, 76D). Pharynx short, through about 3–4 segments; pharyngeal tooth small, on anterior rim (Fig. 75A). Proventricle short in relation to length of body, small, through 3 segments, with 14 muscle cell rows. Pygidium with 2 long anal cirri.

Remarks. *Exogone* (*E.*) *heterosetosa* and *E.* (*E.*) *heterosetoides*, only known from the Southern Hemisphere, both have modified spiniger-like chaetae, with distally enlarged and spinose shafts and relatively short, triangular blades. Recently, another species, *E.* (*E.*) *mompasensis* Martínez, Adarraga & San Martín (2002), with similar chaetae, has been discovered on the Atlantic Spanish coasts. This species differs from these two Southern species in the size of the median antenna, insertion of the antennae, size of the proventricle, and details of the chaetae (Martínez *et al.*, 2002). San Martín (1991a) erroneously placed *E. heterosetoides* in the subgenus *Parexogone*.

Distribution. Australia (Western Australia, South Australia, New South Wales).

Habitat. Common on all shallow bottoms: algae, sand, seagrass, dead corals, mud, etc; intertidal to 33 m depth.

***Exogone* (*Exogone*) *longicornis*
Westheide, 1974**

Fig. 77A–L

Exogone longicornis Westheide, 1974: 117, figs. 54, 55.

Material examined. AUSTRALIA: WESTERN AUSTRALIA. 1 specimen, AM W26666, jetty adjacent to Fisheries Hut, Beacon Island, 28°25.5'S 113°47.0'E, dead coral with plate-like species (*Acropora* and *Montipora*), 12 m, P.A. Hutchings, 23 May 1994. 5 specimens, AM W26667, east side of West Wallabi Island, 28°27.9'S 113°40.9'E, in *Posidonia australis* root mat, plus epifauna, 2 m, P.A. Hutchings, 26 May 1994.

Additional material. Santa Cruz Island, Galápagos Islands, 2 specimens, W. Westheide. Coiba National Park, Panamá, Granito de Oro Island, intertidal coarse sand, 13 specimens.

Description. Both Australian specimens anterior fragments, about 22 chaetigers, one specimen is a mature male with natatory chaetae; complete specimens from Panamá 2.9 mm long, 0.2 mm wide, 33 chaetigers. Body long and slender, filiform. Prostomium square to oval, wider than long; 4 large eyes nearly in rectangular arrangement. Antennae inserted between anterior pair of eyes, close to each other; median antenna long, slightly thick, cylindrical, similar in length to prostomium and palps together or slightly longer; lateral

antennae small, ovoid (Fig. 77A). Palps slightly longer than prostomium, fused all their length, with a distinct dorsal furrow, with a distal notch. Peristomium shorter than following segments, covering posterior margin of prostomium; tentacular cirri small, papilliform. Dorsal cirri ovoid, small, shorter than parapodial lobes, present on all segments (Fig. 77A). Parapodia of chaetiger 1 with 1, sometimes 2, shafts of compound chaetae enlarged, forming a large, stout, triangular process near tips; process covered by small, short spines on distal side of that process (Figs. 77B,C,D), blades relatively short, with moderate long marginal spines, distally bifid, about 14 μm long; in addition about 5–6 compound chaetae with shafts distally slightly enlarged, hemigomph articulations, and a few thin spines, and blades short, about 4–5 μm long, distal tooth slightly shorter than sub-distal tooth, and few thin, moderately long marginal spines (Fig. 77E). Remaining anteriormost parapodia with similar falcigers, and unmodified spiniger-like chaetae. Anterior and midbody parapodia each with solitary spiniger-like chaetae; shafts provided with short spines, and blades relatively short, indistinctly bidentate, with short marginal spines (Fig. 77G), 26 μm long, and 3–4 falcigers, shafts distally slightly enlarged and provided with short spines, and small blades, smooth or provided with short marginal spines (Fig. 77H) similar in length to those of most anterior parapodia. Posterior parapodia of the fragments each with a similar spiniger-like chaetae, with slender blade, apparently unidentate, with minute marginal spines (Fig. 77J), 20 μm long, in addition 3 compound falcigers with short, small, smooth blades, distal tooth small (Fig. 77K), about 4 μm long. Dorsal simple chaetae from chaetiger 2, with rounded tips and finely spinulose subterminally (Fig. 77F,I). Ventral simple chaetae not seen. Acicula solitary, distally rounded (Fig. 77L). Pharynx long, through 5 segments; pharyngeal tooth on anterior margin (Fig. 77A). Proventricle similar in length to pharynx, through 4–5 segments, with 33–38 muscle cell rows.

Remarks. The original description omits the presence of compound spiniger-like chaetae with modified shafts on chaetiger 1; the examined specimens from Galápagos Islands, however, have them as do the Australian specimens and those from Panamá. The figured specimen of the original description (Westheide, 1974, fig. 54A) shows a shorter proventricle and a longer median antenna than those of the Australian specimens; the examined specimen from Galápagos and those from Panamá have a long proventricle, and some specimens have shorter median antenna than others, suggesting that they all represent a single species. *Exogone* (*E.*) *rostrata* Naville, 1933, from the Mediterranean Sea, and the Canary and Madeira Islands, is apparently morphologically identical (see Alós *et al.*, 1983; San Martín, 1984a, 2003; Pascual & Núñez, 1999). It could be a circumtropical species or a complex of similar species; until this problem has been resolved I am retaining the name *longicornis* for the Pacific specimens.

Distribution. Galápagos Islands. Pacific coast of Panamá. Australia (Western Australia).

Habitat. Interstitial in coarse sand; in dead corals. Shallow bottoms.

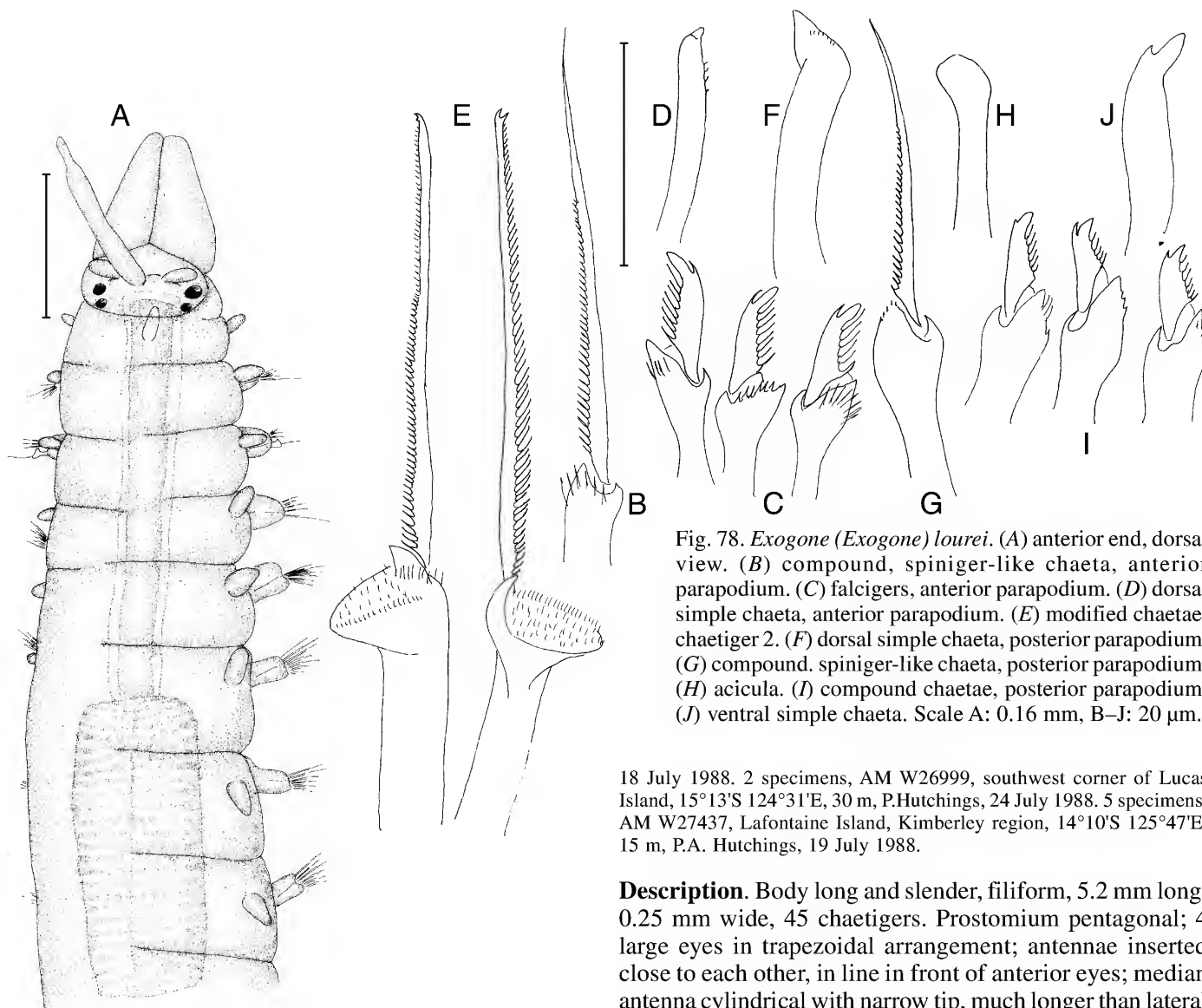


Fig. 78. *Exogone (Exogone) lourei*. (A) anterior end, dorsal view. (B) compound, spiniger-like chaeta, anterior parapodium. (C) falcigers, anterior parapodium. (D) dorsal simple chaeta, anterior parapodium. (E) modified chaetae, chaetiger 2. (F) dorsal simple chaeta, posterior parapodium. (G) compound, spiniger-like chaeta, posterior parapodium. (H) acicula. (I) compound chaetae, posterior parapodium. (J) ventral simple chaeta. Scale A: 0.16 mm, B–J: 20 µm.

18 July 1988. 2 specimens, AM W26999, southwest corner of Lucas Island, 15°13'S 124°31'E, 30 m, P.Hutchings, 24 July 1988. 5 specimens, AM W27437, Lafontaine Island, Kimberley region, 14°10'S 125°47'E, 15 m, P.A. Hutchings, 19 July 1988.

Description. Body long and slender, filiform, 5.2 mm long, 0.25 mm wide, 45 chaetigers. Prostomium pentagonal; 4 large eyes in trapezoidal arrangement; antennae inserted close to each other, in line in front of anterior eyes; median antenna cylindrical with narrow tip, much longer than lateral antennae, slightly shorter than prostomium and palps together; lateral antennae ovate, about $\frac{1}{5}$ – $\frac{1}{6}$ of median antennal length (Fig. 78A). Palps long, fused along their length, triangular with a distal notch (Fig. 78A). Peristomium similar in length to following segments; tentacular cirri similar to lateral antennae but shorter. Dorsal cirri ovate to slightly pyriform, slightly longer than lateral antennae, shorter than parapodial lobes, present on all segments (Fig. 78A). Anterior parapodia each with 1 compound spiniger-like chaeta, with unidentate, long and slender blade, 42 µm long, short marginal spines of blade and few subdistal spines on shaft (Fig. 78B); in addition 4–5 falcigers with long subdistal tooth and short distal tooth, moderately long marginal spines (Fig. 78C), 12–10 µm long. Spiniger-like chaetae of chaetiger 2 with thick shafts, provided with a triangular process with minute spines on surface, and long, about 43 µm long, distally bifid blade, with moderate to short marginal spines (Fig. 78E). Compound chaetae similar throughout but posteriorly with shorter spines and shorter blades; posterior parapodia each with 1 spiniger-like (Fig. 78G), blades 28 µm long, and 3 falcigers, blades 8–9 µm long (Fig. 78I). Dorsal simple chaetae from anterior parapodia, with rounded tips and finely spinulose subterminally (Fig. 78D), thicker posteriorly (Fig. 78F). Ventral simple chaetae on posterior parapodia, sigmoid, smooth, bidentate, subdistal tooth long and broad, distal tooth small (Fig. 78J). Acicula solitary, slender, distally

Exogone (Exogone) lourei
Berkeley & Berkeley, 1938

Fig. 78A–J

Exogone lourei Berkeley & Berkeley, 1938: 44, figs. 6–12; Rioja, 1941: 703, pl. 3, figs. 10–13; Hartman, 1968: 425, figs. 1–5; Banse, 1972: 200, figs. 5a–d; Perkins, 1981: 1092; Uebelacker, 1984 (in part): 30–39, fig. 30–34a–f.

Exogone (Exogone) lourei.—San Martín, 1991a: 728, 735; Núñez *et al.*, 1992: 45, fig. 2; Kudenov & Harris, 1995: 15, fig. 1.3.

Material examined. AUSTRALIA: WESTERN AUSTRALIA. 1 specimen, AM W26991, Goss Passage, Beacon Island, 28°25.5'S 113°47.0'E, dead branching coral substrate covered in coralline algae, 10 m, P.Hutchings, 18 May 1994. 12 specimens, AM W26992, Goss Passage, Beacon Island, 28°25.5'S 113°47.0'E, dead plate-coral substrate covered in coralline algae, 8 m, P.Hutchings, 22 May 1994. 1 specimen, AM W26993, off south end of Long Island, Beacon Island, 28°28.8'S 113°46.5'E, dead coral substrate embedded in calcareous substrate, 30 m, P.Hutchings, 22 May 1994. 7 specimens, AM W26994, off jetty near Fisheries Hut, Beacon Island, 28°25.5'S 113°47.0'E, dead coral substrate, plate-like spp., *Acropora*, *Montipora*, 12 m, P.Hutchings, 23 May 1994. 1 specimen, AM W26995, northeast entrance to Goss Passage, Beacon Island, 28°27.9'S 113°46.9'E, dead branching coral substrate, covered with coralline algae, 24 m, P.Hutchings, 25 May 1994. 2 specimens, AM W26996, off south end of Long Island, Beacon Island, 28°28.8'S 113°46.3'E, dead coral substrate covered in coralline algae, 5 m, P.Hutchings, 25 May 1994. 1 specimen, AM W26997, East Montlivet Island, 15°06'S 125°18'E, 6 m, P.Hutchings, 16 July 1988. 1 specimen, AM W26998, west side of Cassini Island, 13°57'S 125°37'E, P.Hutchings,

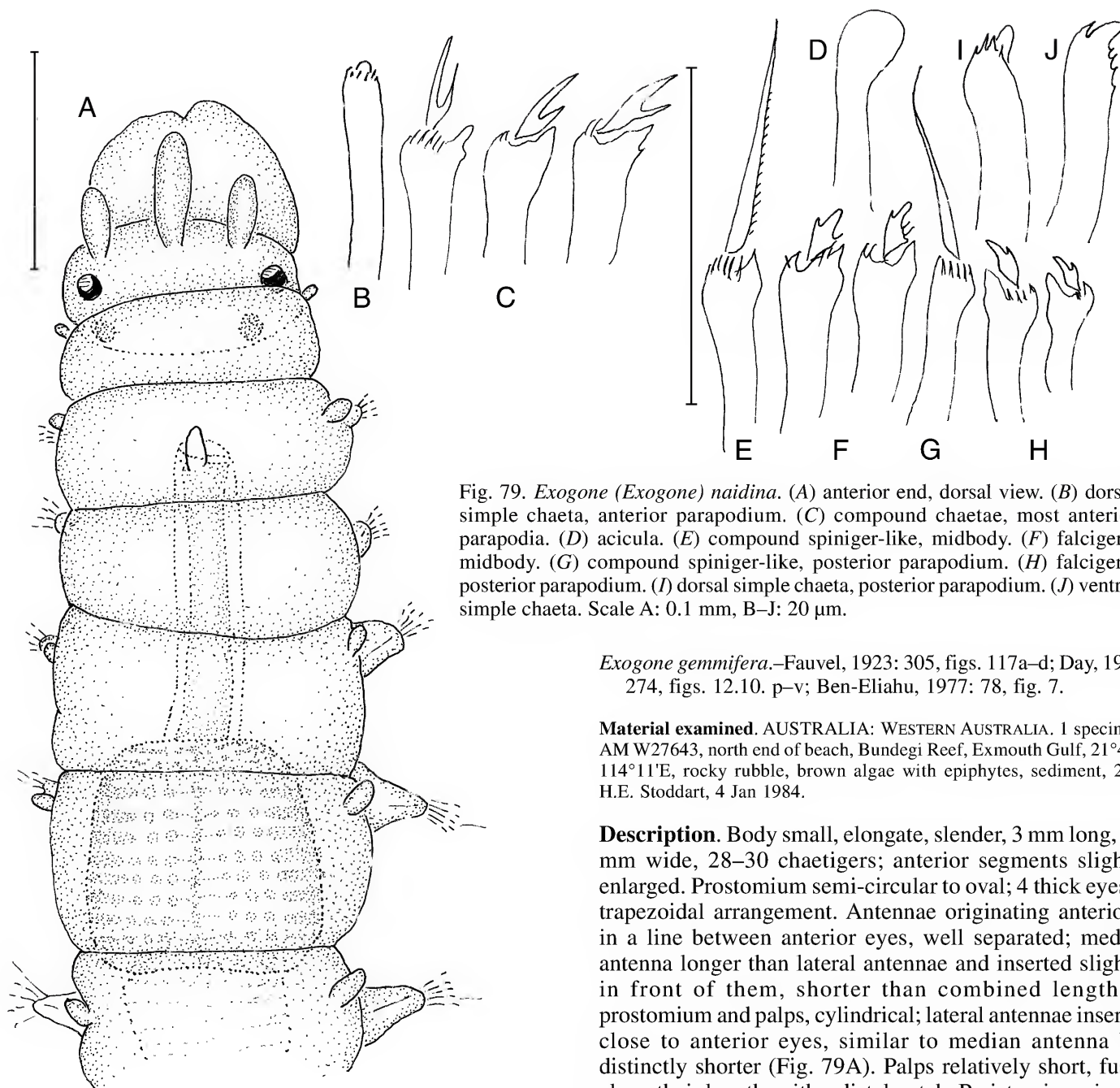


Fig. 79. *Exogone (Exogone) naidina*. (A) anterior end, dorsal view. (B) dorsal simple chaeta, anterior parapodium. (C) compound chaetae, most anterior parapodia. (D) acicula. (E) compound spiniger-like, midbody. (F) falcigers, midbody. (G) compound spiniger-like, posterior parapodium. (H) falcigers, posterior parapodium. (I) dorsal simple chaeta, posterior parapodium. (J) ventral simple chaeta. Scale A: 0.1 mm, B–J: 20 µm.

Exogone gemmifera.—Fauvel, 1923: 305, figs. 117a–d; Day, 1967: 274, figs. 12.10. p–v; Ben-Eliahu, 1977: 78, fig. 7.

Material examined. AUSTRALIA: WESTERN AUSTRALIA. 1 specimen, AM W27643, north end of beach, Bundegi Reef, Exmouth Gulf, 21°49'S 114°11'E, rocky rubble, brown algae with epiphytes, sediment, 2 m, H.E. Stoddart, 4 Jan 1984.

Description. Body small, elongate, slender, 3 mm long, 0.2 mm wide, 28–30 chaetigers; anterior segments slightly enlarged. Prostomium semi-circular to oval; 4 thick eyes in trapezoidal arrangement. Antennae originating anteriorly in a line between anterior eyes, well separated; median antenna longer than lateral antennae and inserted slightly in front of them, shorter than combined length of prostomium and palps, cylindrical; lateral antennae inserted close to anterior eyes, similar to median antenna but distinctly shorter (Fig. 79A). Palps relatively short, fused along their length, with a distal notch. Peristomium similar to following segments in length; tentacular cirri minute, papilliform. Dorsal cirri similar to tentacular cirri but longer, distinctly shorter than lateral antennae, absent on chaetiger 2 (Fig. 79A). Parapodia of anteriormost 3 segments, each with 4–5 compound chaetae with spinose shafts and short, unidentate blades, about 6 µm, each provided with a long basal spur, making them appear bifid (Fig. 79C). Parapodia from chaetiger 4 each with 1 compound chaetae with unidentate, spiniger-like blade, short marginal spines (Fig. 79E), about 14 µm long, and 3 compound falcigers, shafts provided with subdistal and distal spines, and short blades, with long subdistal teeth and short distal teeth (Fig. 79F), about 5 µm long; posterior parapodia each with one spiniger-like, similar to those of anterior parapodia and midbody, but provided with shorter, smooth blade (Fig. 79G), about 11 µm long, and 2 compound falcigers with short, smooth blades (Fig. 79H). Dorsal simple chaetae from anterior parapodia, with rounded tips and finely spinulose subterminally (Fig. 79B), thicker posteriorly (Fig. 79I). Ventral simple chaetae on posterior parapodia, sigmoid, bidentate, subdistal tooth long and distal tooth short, with few, short

rounded (Fig. 78H). Pharynx long, slender, through 6–7 segments; pharyngeal tooth on anterior margin (Fig. 78A); Proventricle shorter than pharynx, through 3 segments, with about 23 muscle cell rows. Pygidium with 2 long anal cirri.

Distribution. Pacific coasts from British Columbia to Panamá. Caribbean area: Florida, Gulf of México, Belize, Cuba. Eastern Atlantic (Canary Islands). Australia (Western Australia).

Habitat. Intertidal in coarse to medium sand. Inside dead corals. Intertidal to about 30 m depth.

Exogone (Exogone) naidina Örsted, 1845

Fig. 79A–J

Exogone naidina Örsted, 1845: 20, Figs. 1–14; Hartmann-Schröder, 1971: 171, figs. 56 a–c; 1979: 108, fig. 163; 1980a: 56; 1981: 38; 1982: 74; 1984: 25; 1986: 45; Gardiner, 1976: 132, figs. 11j–n; San Martín, 1984a: 208, pl. 46.
Exogone (Exogone) naidina San Martín, 2003: 262, figs. 142, 143.

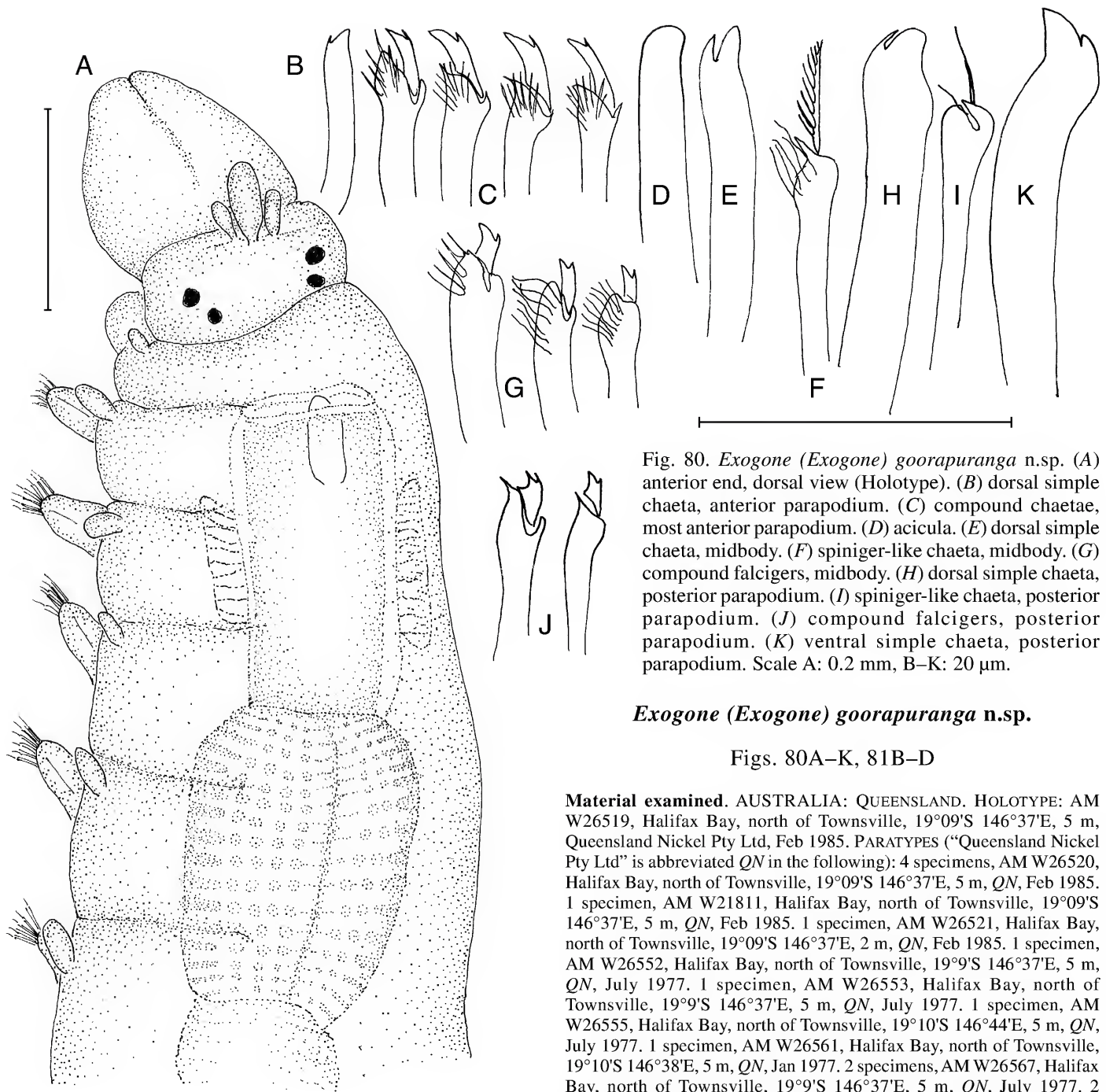


Fig. 80. *Exogone (Exogone) goorapuranga* n.sp. (A) anterior end, dorsal view (Holotype). (B) dorsal simple chaeta, anterior parapodium. (C) compound chaetae, most anterior parapodium. (D) acicula. (E) dorsal simple chaeta, midbody. (F) spiniger-like chaeta, midbody. (G) compound falcigers, midbody. (H) dorsal simple chaeta, posterior parapodium. (I) spiniger-like chaeta, posterior parapodium. (J) compound falcigers, posterior parapodium. (K) ventral simple chaeta, posterior parapodium. Scale A: 0.2 mm, B–K: 20 µm.

***Exogone (Exogone) goorapuranga* n.sp.**

Figs. 80A–K, 81B–D

Material examined. AUSTRALIA: QUEENSLAND. HOLOTYPE: AM W26519, Halifax Bay, north of Townsville, 19°09'S 146°37'E, 5 m, Queensland Nickel Pty Ltd, Feb 1985. PARATYPES ("Queensland Nickel Pty Ltd" is abbreviated *QN* in the following): 4 specimens, AM W26520, Halifax Bay, north of Townsville, 19°09'S 146°37'E, 5 m, *QN*, Feb 1985. 1 specimen, AM W21811, Halifax Bay, north of Townsville, 19°09'S 146°37'E, 5 m, *QN*, Feb 1985. 1 specimen, AM W26521, Halifax Bay, north of Townsville, 19°09'S 146°37'E, 2 m, *QN*, Feb 1985. 1 specimen, AM W26552, Halifax Bay, north of Townsville, 19°9'S 146°37'E, 5 m, *QN*, July 1977. 1 specimen, AM W26553, Halifax Bay, north of Townsville, 19°9'S 146°37'E, 5 m, *QN*, July 1977. 1 specimen, AM W26555, Halifax Bay, north of Townsville, 19°10'S 146°44'E, 5 m, *QN*, July 1977. 1 specimen, AM W26561, Halifax Bay, north of Townsville, 19°10'S 146°38'E, 5 m, *QN*, Jan 1977. 2 specimens, AM W26567, Halifax Bay, north of Townsville, 19°9'S 146°37'E, 5 m, *QN*, July 1977. 2 specimens, AM W26568, Halifax Bay, north of Townsville, 19°09'S 146°37'E, 2 m, *QN*, Feb 1985. 1 specimen, AM W26572, Halifax Bay, north of Townsville, 19°10'S 146°44'E, 5 m, *QN*, Jan 1977. 4 specimens, AM W26574, Halifax Bay, north of Townsville, 19°10'S 146°38'E, 5 m, *QN*, July 1977. 4 specimens, AM W26575, Halifax Bay, north of Townsville, 19°10'S 146°37'E, 2 m, *QN*, Jan 1977. 1 specimen, AM W26580, Halifax Bay, north of Townsville, 19°7'S 146°33'E, 2 m, *QN*, Jan 1977. 5 specimens, AM W26581, Halifax Bay, north of Townsville, 19°10'S 146°44'E, 5 m, *QN*, July 1977. 2 specimens, AM W26584, Halifax Bay, north of Townsville, 19°10'S 146°36'E, 2 m, *QN*, July 1977. 1 specimen, AM W26585, between bommies inside lagoon entrance, Lizard Island, 14°40'S 145°28'E, medium to fine sediment, 18 m, A.R. Jones & C. Short, 9 Oct 1978. 2 specimens, AM W26586, 600 m SW of Research Point, lagoon, south Lizard Island, 14°40'S 145°28'E, coarse to medium sediment, 4.5 m, A.R. Jones & C. Short, 10 Oct 1978. 1 specimen, AM W26587, 100 m off eastern end of Mangrove Beach, south Lizard Island, 14°40'S 145°28'E, 3.6 m, A.R. Jones & C. Short, 11 Oct 1978. 4 specimens, AM W26588, 600 m SW of Research Point, lagoon, south Lizard Island, 14°40'S 145°28'E, coarse to medium sediment, 4.5 m, A.R. Jones & C. Short, 10 Oct 1978. 1 specimen, AM W26589, 100 m off eastern end of Mangrove Beach, Lizard Island, 14°40'S 145°28'E, 3.6 m, A.R. Jones & C. Short, 11 Oct 1978. 1 specimen, AM W26590, 600 m SW of Research Point, lagoon, south Lizard Island, 14°40'S 145°28'E, coarse to medium sediment, 4.5 m,

subdistal marginal spines (Fig. 79J). Acicula solitary, slender, distally rounded (Fig. 79D). Pygidium with 2 long anal cirri. Pharynx long and slender, through 3 segments; pharyngeal tooth on anterior rim (Fig. 79A). Proventricle short, through 1–2 segments, with 14–16 muscle cell rows.

Remarks. This species is apparently cosmopolitan in temperate and tropical waters. In Australia it has been reported all around, but perhaps some of these reports could be referred to other similar species. *Exogone (Exogone) dwisula* Kudenov & Harris, 1995, from California, is similar, but the proventricle is longer, through 1.5–2 segments (Kudenov & Harris, 1995).

Distribution. Cosmopolitan. Australia (all States).

Habitat. Shallow waters, on algae, fine to coarse sand, seagrasses.

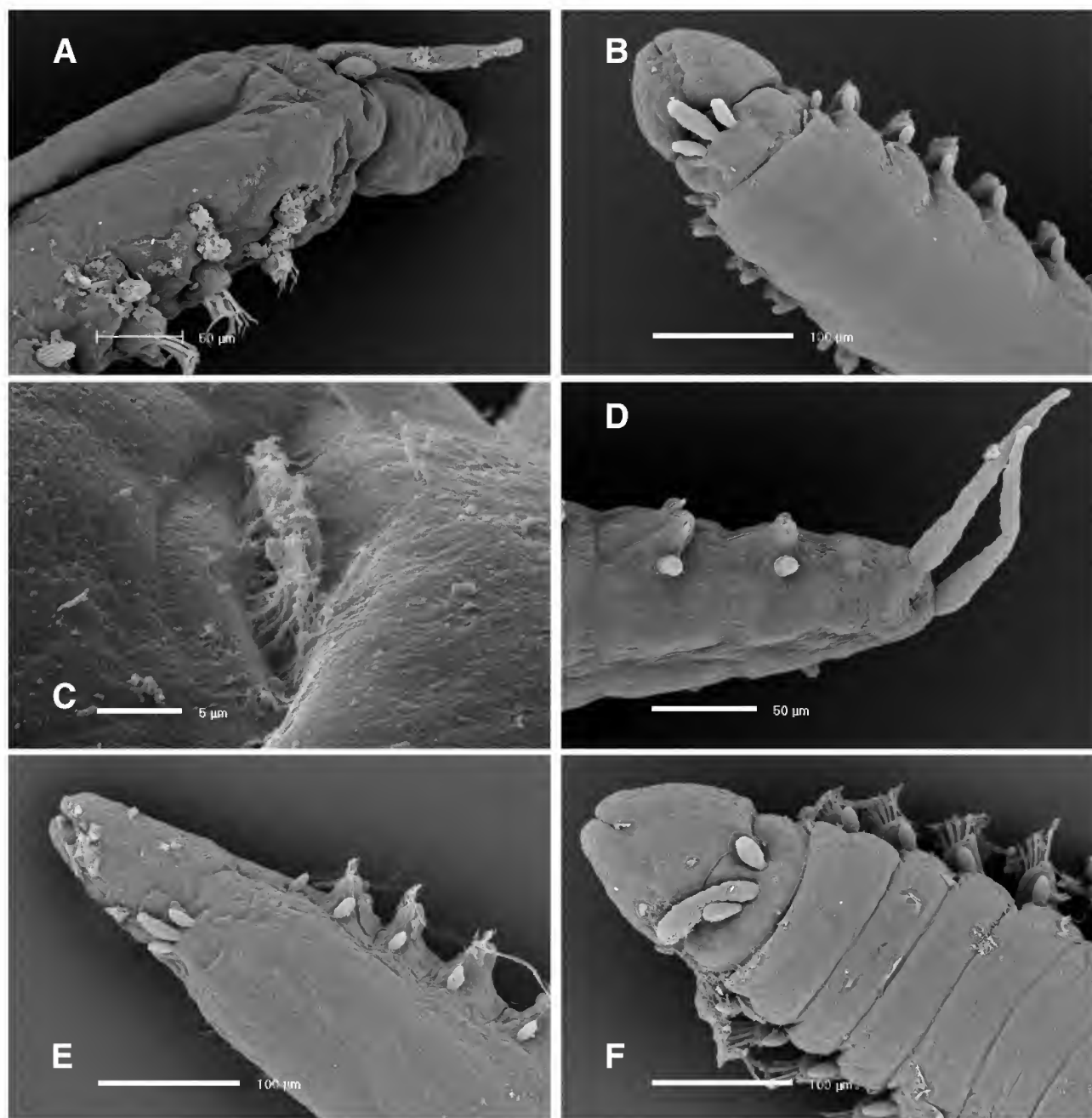


Fig. 81. SEM of *Exogone* (*Exogone*) *longicornis*, (A) anterior end, dorsal view. SEM of *Exogone* (*Exogone*) *goorapuranga*, (B) anterior end, dorsal view. (C) detail of nuchal organs. (D) posterior end, lateral view. SEM of *Exogone* (*Exogone*) *breviantennata*, A, anterior end, dorsal view. SEM of *Exogone* (*Exogone*) *dispar*, A, anterior end, dorsal view.

A.R. Jones & C. Short, 11 Oct 1978. 1 specimen, AM W26591, lagoon at south end of Lizard Island, 14°40'S 145°28'E, 3.6 m, A.R. Jones & C. Short, 11 Oct 1978. 2 specimens, AM W26592, 400 m off Chinamans Ridge, Watson's Bay, Lizard Island, 14°40'S 145°28'E, filamentous algae, 12 m, A.R. Jones & C. Short, 13 Oct 1978. 1 specimen, AM W26593, 600 m SW of Research Point, lagoon, south Lizard Island, 14°40'S 145°28'E, coarse to medium sediment, 4.5 m, A.R. Jones & C. Short, 10 Oct 1978. 1 specimen, AM W26594, 100 m off eastern end of Mangrove Beach, south Lizard Is., 14°40'S 145°28'E, 3.6 m, A.R. Jones & C. Short, 11 Oct 1978. 1 specimen, AM W26595, 100 m off Mangrove Beach, south end of Lizard Island, 14°40'S 145°28'E, coarse to medium sediment, 3 m, A.R. Jones & C. Short, 13 Oct 1978. 1 specimen, AM W26596, 100 m off Mangrove Beach, south end of Lizard Island, 14°40'S 145°28'E, coarse to medium sediment, 3 m, A.R. Jones & C. Short, 13 Oct 1978. 1 specimen, AM W26597, 1000 m off Chinamans Ridge, Watson's Bay, Lizard Island, 14°40'S 145°28'E, seagrasses, 21.2 m, A.R. Jones & C. Short, 13 Oct 1978. 1 specimen, AM W26598, 200 m SW of Freshwater Beach, lagoon at south end of Lizard Island, 14°40'S 145°28'E, medium sediment, 3 m, A.R. Jones & C. Short, 10 Oct 1978. 1 specimen, AM W26599, 600 m SW of Research Point, lagoon at south end of Lizard Island, 14°40'S 145°28'E, coarse to medium sediment, 4.5 m, A.R. Jones & C. Short, 10 Oct 1978. 4 specimens, AM W26600,

600 m SW of Research Point, lagoon at south end of Lizard Island, 14°40'S 145°28'E, coarse to medium sediment, 4.5 m, A.R. Jones & C. Short, 10 Oct 1978. 1 specimen, AM W26601, 100 m off Mangrove Beach, lagoon at south end of Lizard Island, 14°40'S 145°28'E, coarse to medium sediment, 3 m, A.R. Jones & C. Short, 13 Oct 1978. 3 specimens, AM W26602, 1000 m off Chinamans Ridge, western coast of Lizard Island, 14°40'S 145°28'E, seagrasses, 21.2 m, A.R. Jones & C. Short, 13 Oct 1978. 1 specimen, AM W26603, between bommies inside lagoon entrance, south end of Lizard Island, 14°40'S 145°28'E, medium to fine sediment, 18 m, A.R. Jones & C. Short, 9 Oct 1978. 1 specimen, AM W26604, 100 m off Mangrove Beach, lagoon at south end of Lizard Island, 14°40'S 145°28'E, medium sediment, 3 m, A.R. Jones & C. Short, 13 Oct 1978. 4 specimens, AM W26605, 1000 m off Chinamans Ridge, Watsons Bay, west coast of Lizard Island, 14°40'S 145°28'E, seagrasses, 21.2 m, A.R. Jones & C. Short, 13 Oct 1978. 6 specimens, AM W26606, 1 km off Chinamans Ridge, Watsons Bay, Lizard Island, 14°40'S 145°28'E, seagrasses, 21.2 m, A.R. Jones & C. Short, 13 Oct 1978. 1 specimen, AM W26607, 400 m off Chinamans Ridge, Watsons Bay, west coast of Lizard Island, 14°40'S 145°28'E, filamentous algae, 12 m, A.R. Jones & C. Short, 13 Oct 1978. 1 specimen, AM W26608, 100 m off Chinamans Ridge, Watsons Bay, west coast of Lizard Island, 14°40'S 145°28'E, sand, 9 m, A.R. Jones & C. Short, 13 Oct 1978. 2 specimens,

AM W26609, 600 m west of Research Point, lagoon at south end of Lizard Island, 14°40'S 145°28'E, coarse to medium sediment, 4.5 m, A.R. Jones & C. Short, 10 Oct 1978. 4 specimens, AM W202674, Triangular Island, Shoalwater Bay, 22°23'S 150°31'E, J.A. Lewis & J.R. Forsyth, 1981. WESTERN AUSTRALIA. 1 specimen, AM W27053, Goss Passage, Beacon Island, 28°25.5'S 113°47.0'E, dead coral plates covered in coralline algae, 8 m, P.A. Hutchings, 22 May 1994. 2 specimens, AM W27054, southeast end of Long Island, 28°28.8'S 113°46.5'E, dead coral embedded in calcareous substrate, 30 m, P.A. Hutchings, 22 May 1994. 3 specimens, AM W27055, Goss Passage, Beacon Island, 28°25.5'S 113°47.0'E, dead coral substrate embedded in fine sediment, 33 m, P.A. Hutchings, 23 May 1994. 2 specimens, AM W27452, north end of beach, Bundegi Reef, Exmouth Gulf, 21°49'S 114°11'E, rocky rubble, coralline algae with green epiphyte, 2 m, H.E. Stoddart, 4 Jan 1984. 1 specimen, AM W27661, 5 km offshore, Bush Bay, 30 km south of Carnarvon, 25°10'S 113°39'E, airlift in strap-leaved seagrass beds, 2 m, J.K. Lowry and R.T. Springthorpe, 6 Jan 1984.

Description. Body long, slender, filiform, holotype incomplete, 2.5 mm long, 0.4 mm wide, 26 chaetigers; longest paratype 3 mm long for 35 chaetigers. Prostomium oval, wider than long; 4 eyes in trapezoidal arrangement. Antennae small, originating close to each other near middle of anterior margin of prostomium (Figs. 80A, 81B); lateral antennae papilliform, median antenna about twice as long as lateral antennae (Figs. 80A, 81B). Palps long, broad, fused along their length, with a dorsal furrow and a distal notch (Figs. 80A, 81B). Peristomium similar in length to following segments, covering dorsal posterior part of prostomium; tentacular cirri minute, smaller than lateral antennae. Dorsal cirri ovoid, shorter than parapodial lobes, similar in size to lateral antennae, present on all segments (Figs. 80A, 81B). Antermost 6 chaetigers each with 5–6 compound falcigers, blades with subdistal tooth long and wide, distal tooth small, marginally smooth, shafts provided with long spines (Fig. 80C), blades about 6 µm long, without spiniger-like chaetae. From about chaetiger 7 posteriorly, parapodia each with 1 compound spiniger-like chaeta, with short, unidentate blade, 7–8 µm long, with long marginal spines (Fig. 80F), and 3 falcigers similar to those of anterior parapodia but shorter (Fig. 80G), 2–3 µm long; shafts of all compound chaetae provided with long, fine subdistal spines. Progressively posteriorly, both shafts and blades become less spinose; posterior parapodia each with 1 compound spiniger-like chaeta, with filiform, minute, smooth blade and distally enlarged, nearly smooth shaft (Fig. 80I), and 2 falcigers, with smooth shafts and minute blades (Fig. 80J). Dorsal simple chaetae from anterior parapodia, smooth, bidentate, subdistal tooth long and distal tooth minute (Fig. 80B), thicker and provided with relatively longer distal tooth posteriorly (Fig. 80E,H). Ventral simple chaetae on posterior parapodia, sigmoid, smooth, similar to posterior dorsal simple chaetae (Fig. 80K). Acicula solitary, slender, distally rounded (Fig. 80D). Pharynx short and relatively wide, through 3 segments; lateral muscles of pharynx distinct, giving appearance of one gland on each side (Fig. 80A); pharyngeal tooth wide and long (Fig. 80A). Proventricle short, through 2 segments, with 18 muscle cell rows. Pygidium with 2 long anal cirri (Fig. 81D).

Remarks. Apparently, *Exogone (E.) goorapuranga* n.sp. resembles *E. naidina*; it lacks, however, compound chaetae with modified blades on anteriormost parapodia, and the shafts of compound chaetae have long, hair-like spines. Probably, some records of *E. (E.) naidina* from Australia should be referred to *Exogone (E.) goorapuranga*.

Distribution. Australia (Queensland, Western Australia).

Habitat. On fine to coarse sediment, inside dead corals, algae; intertidal to 33 m depth.

Etymology. The name of the species is derived from the combination of two Aboriginal words, *goora* which means, amongst others, long, and *puranga*, which means hairs, in reference to the long hairs or spines on shafts of compound chaetae.

Exogone (Exogone) arrakatarkoola n.sp.

Fig. 82A–L

Material examined. AUSTRALIA: QUEENSLAND. HOLOTYPE: AM W26364, lagoon at south end of Lizard Island, 250 m ESE of Palfrey Island, 14°40'S 145°28'E, very fine sediment, 12 m, C. Short & A.R. Jones, 12 Oct 1978. PARATYPES: 4 specimens, AM W26365, 100 m off Mangrove Beach, Lizard Island, 14°40'S 145°28'E, coarse to medium sediment, 3 m, C. Short & A.R. Jones, 13 Oct 1978. PARATYPES: 4 specimens, AM W26366, 100 m off Mangrove Beach, Lizard Island, 14°40'S 145°28'E, medium sediment, 3 m, C. Short & A.R. Jones, 13 Oct 1978. PARATYPES: 3 specimens, AM W26367, 100 m off Mangrove Beach, Lizard Island, 14°40'S 145°28'E, medium sediment, 3 m, C. Short & A.R. Jones, 13 Oct 1978. PARATYPE: 1 specimen, AM W26368, 100 m off east end of Mangrove Beach, Lizard Island, 14°40'S 145°28'E, 3.6 m, C. Short & A.R. Jones, 11 Oct 1978. PARATYPE: 1 specimen, AM W26369, 100 m off east end of Mangrove Beach, Lizard Island, 14°40'S 145°28'E, 3.6 m, C. Short & A.R. Jones, 11 Oct 1978. PARATYPES: 4 specimens, AM W26370, 100 m off Mangrove Beach, south end of Lizard Island, 14°40'S 145°28'E, medium sediment, 3 m, C. Short & A.R. Jones, 13 Oct 1978. PARATYPES: 4 specimens, AM W26371, 400 m off Chinamans Ridge, Lizard Island, 14°40'S 145°28'E, 12 m, C. Short & A.R. Jones, 13 Oct 1978. PARATYPES: 2 specimens, AM W26372, 100 m off Mangrove Beach, south end of Lizard Island, 14°40'S 145°28'E, coarse to medium sediment, 3 m, C. Short & A.R. Jones, 13 Oct 1978. PARATYPES: 5 specimens, AM W26373, 100 m off Mangrove Beach, south end of Lizard Island, 14°40'S 145°28'E, medium sediment, 3 m, C. Short & A.R. Jones, 13 Oct 1978. 2 specimens, AM W26559, Halifax Bay, north of Townsville, 19°9'S 146°37'E, 5 m, QN, Jan 1977. 18 specimens, AM W26560, Halifax Bay, north of Townsville, 19°10'S 146°44'E, 5 m, QN, Jan 1977. 1 specimen, AM W26573, Halifax Bay, north of Townsville, 19°10'S 146°44'E, 5 m, QN, July 1977. 11 specimens, AM W26578, Halifax Bay, north of Townsville, 19°10'S 146°44'E, 5 m, QN, July 1977. 4 specimens, AM W26579, Halifax Bay, north of Townsville, 19°10'S 146°37'E, 5 m, QN, Jan 1977. 2 specimens, AM W26583, Halifax Bay, north of Townsville, 19°10'S 146°38'E, 5 m, QN, July 1977. 1 specimen, AM W26793, 3 m from coral bommie in lagoon at south end of Lizard Island, 14°40'S 145°28'E, coarse to medium sand, 3 m, A. Jones and C. Short, 13 Oct 1978. 1 specimen on SEM stub, AM W26891, Hinchinbrook Channel, 18°20'S 146°4'E, tidal mud- and sandflats, S. Dittmann, 14 Oct 1989.

Description. Body long, slender, filiform, 3.8–4 mm long, 0.2 mm wide, 40 chaetigers. Prostomium oval to rectangular, about 2.5 times wider than long; 4 large eyes in trapezoidal arrangement, anterior pair slightly larger than posterior pair; antennae located close to each other, between anterior eyes (Fig. 82A); median antenna cylindrical, shorter than prostomium, lateral antennae shorter, slightly more than ½ the length of median antenna (Fig. 82A). Palps broad, fused along their length, relatively short, slightly longer than prostomium. Peristomium distinct; tentacular cirri small, papilliform. Dorsal cirri longer than tentacular cirri, similar in length to lateral antennae, slightly pyriform (Fig. 82A), present on all segments. Antermost 2–3 parapodia each with about 8 compound chaetae, heterogomph, with long subdistal spines on shafts, and falcigerous blades, 1–2 dorsalmost chaetae with blades provided with indistinct distal tooth and long subdistal tooth, moderately long

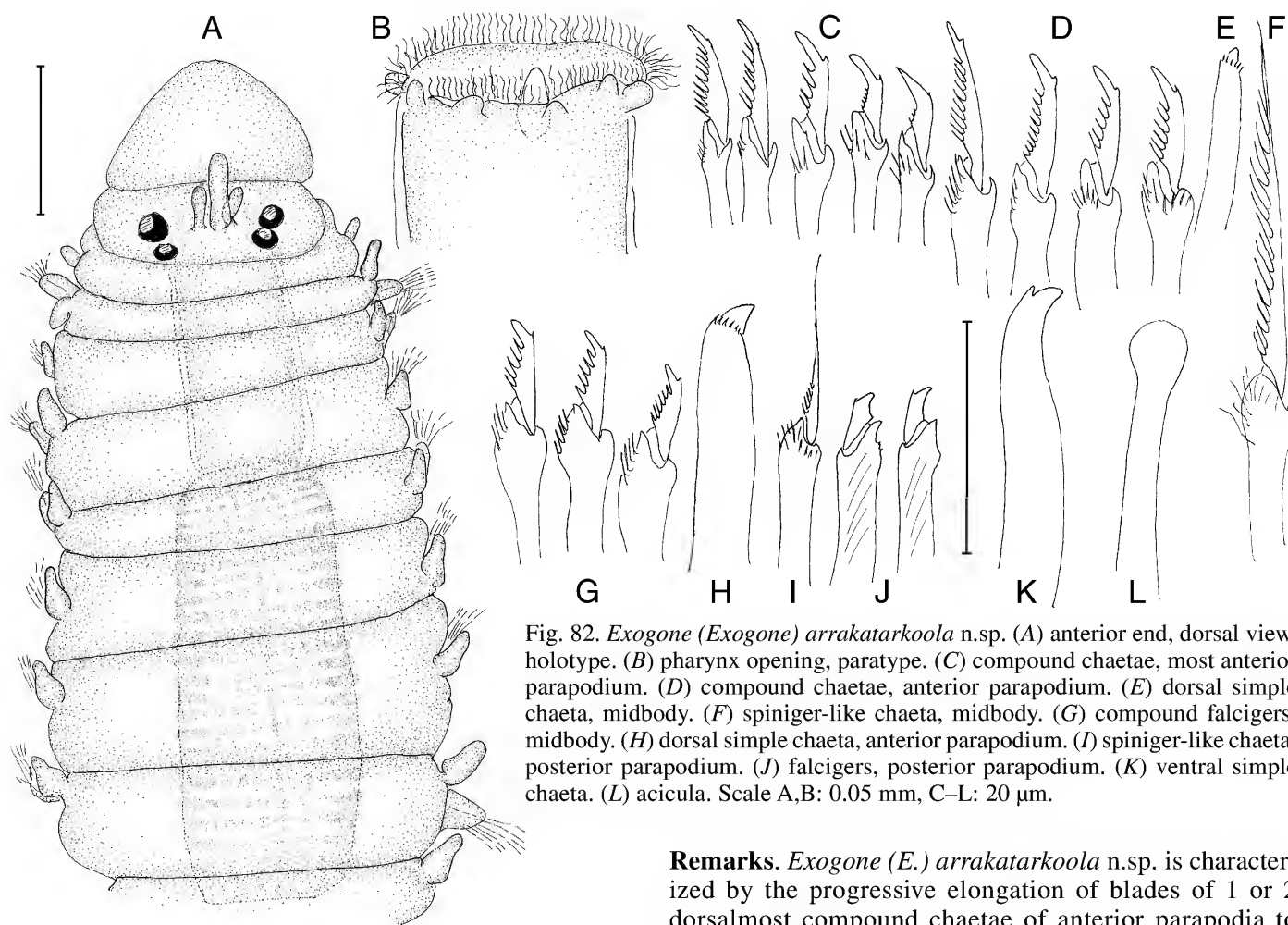


Fig. 82. *Exogone (Exogone) arrakatarkoola* n.sp. (A) anterior end, dorsal view, holotype. (B) pharynx opening, paratype. (C) compound chaetae, most anterior parapodium. (D) compound chaetae, anterior parapodium. (E) dorsal simple chaeta, midbody. (F) spiniger-like chaeta, midbody. (G) compound falcigers, midbody. (H) dorsal simple chaeta, anterior parapodium. (I) spiniger-like chaeta, posterior parapodium. (J) falcigers, posterior parapodium. (K) ventral simple chaeta. (L) acicula. Scale A,B: 0.05 mm, C–L: 20 µm.

marginal spines and about 12–13 µm long, remaining compound chaetae with blades slightly shorter, 11–10 µm long, with shorter marginal spines and distal tooth slightly longer than those of dorsalmost ones (Fig. 82C). On parapodia of following 3–5 segments dorsalmost 1–2 compound chaetae have slightly elongate blades, about 15 µm long, with moderately long marginal spines; the remaining 6–7 compound chaetae with blades similar to those of anteriormost parapodia but slightly longer, about 12 µm long (Fig. 82D). Progressively posteriorly, 1–2 dorsalmost elongate falcigers transformed to spiniger-like chaetae, with spinose shafts, unidentate, filiform blades, provided with long marginal spines (Fig. 82F), blades about 34 µm long in midbody; remaining falcigers similar to those of anterior parapodia, but shorter (Fig. 82G), blades about 10 µm above, 8 µm below, numbering 3 on midbody segments. Posterior parapodia each with 1 compound spiniger-like chaetae, with filiform, nearly smooth blade (Fig. 82I), 19 µm long, and 2, sometimes 3, falcigers, with nearly smooth shafts and short, smooth blades, about 5 µm long (Fig. 82J). Dorsal simple chaetae from anterior parapodia, sometimes from chaetiger 1, with rounded tips and finely spinulose subterminally (Fig. 82E), thicker posteriorly (Fig. 82H). Ventral simple chaetae on posterior parapodia, sigmoid, smooth, with small distal tooth and longer subdistal tooth (Fig. 82K). Pharynx long, through about 5–6 segments; pharyngeal tooth located on anterior rim, surrounded by 10 soft papillae and a dense crown of long cilia (Fig. 82B). Proventricle similar in length to pharynx, through about 4–5 segments, with 32 muscle cell rows. Pygidium with 2 long anal cirri.

Remarks. *Exogone (E.) arrakatarkoola* n.sp. is characterized by the progressive elongation of blades of 1 or 2 dorsalmost compound chaetae of anterior parapodia to spiniger-like blades. *Exogone (E.) naidina* and *E. (E.) goorapuranga* also lack spiniger-like chaetae on anteriormost parapodia but *Exogone (E.) arrakatarkoola* has a much longer proventricle than either of these two species, lacks compound chaetae with modified blades on anteriormost parapodia, characteristic of *Exogone (E.) naidina*, and long spines on shafts of compound chaetae, present in *E. (E.) goorapuranga*.

Distribution. Australia (Queensland).

Habitat. Interstitial in fine to coarse sediment.

Etymology. The specific name is derived from a combination of two Aboriginal words, *arkoola*, meaning hair, and *arrakata* meaning mouth, in reference to the long cilia or “hairs” on the pharynx opening.

***Exogone (Exogone) ingridae* n.sp.**

Fig. 83A–N

Material examined. AUSTRALIA: NEW SOUTH WALES. HOLOTYPE: AM W26451, 150 m east of Burrill Rocks, 35°23.41'S 150°28.18'E, surface of sponges, 19 m, P. Berents *et al.*, 1 May 1997. PARATYPES: 8 specimens, AM W26452, 150 m east of Burrill Rocks, 35°23.41'S 150°28.18'E, on surface of sponges, 17 m, K. Attwood, 1 May 1997. WESTERN AUSTRALIA. 1 specimen, AM W27090, Goss Passage, Beacon Island, 28°25.5'S 113°47.0'E, dead *Acropora* plates with sponges, ascidians & algae, 23 m, P.A. Hutchings, 19 May 1994. 1 specimen, AM W27091, off jetty near Fisheries Hut, Beacon Island, 28°25.5'S 113°47.0'E, dead plate-coral substrate, *Acropora*, *Montipora*, 12 m, P.A. Hutchings, 23 May 1994.

Description. Body long, relatively broad, 4 mm long, 0.3 mm wide, 38 chaetigers. Prostomium oval to subpentagonal,

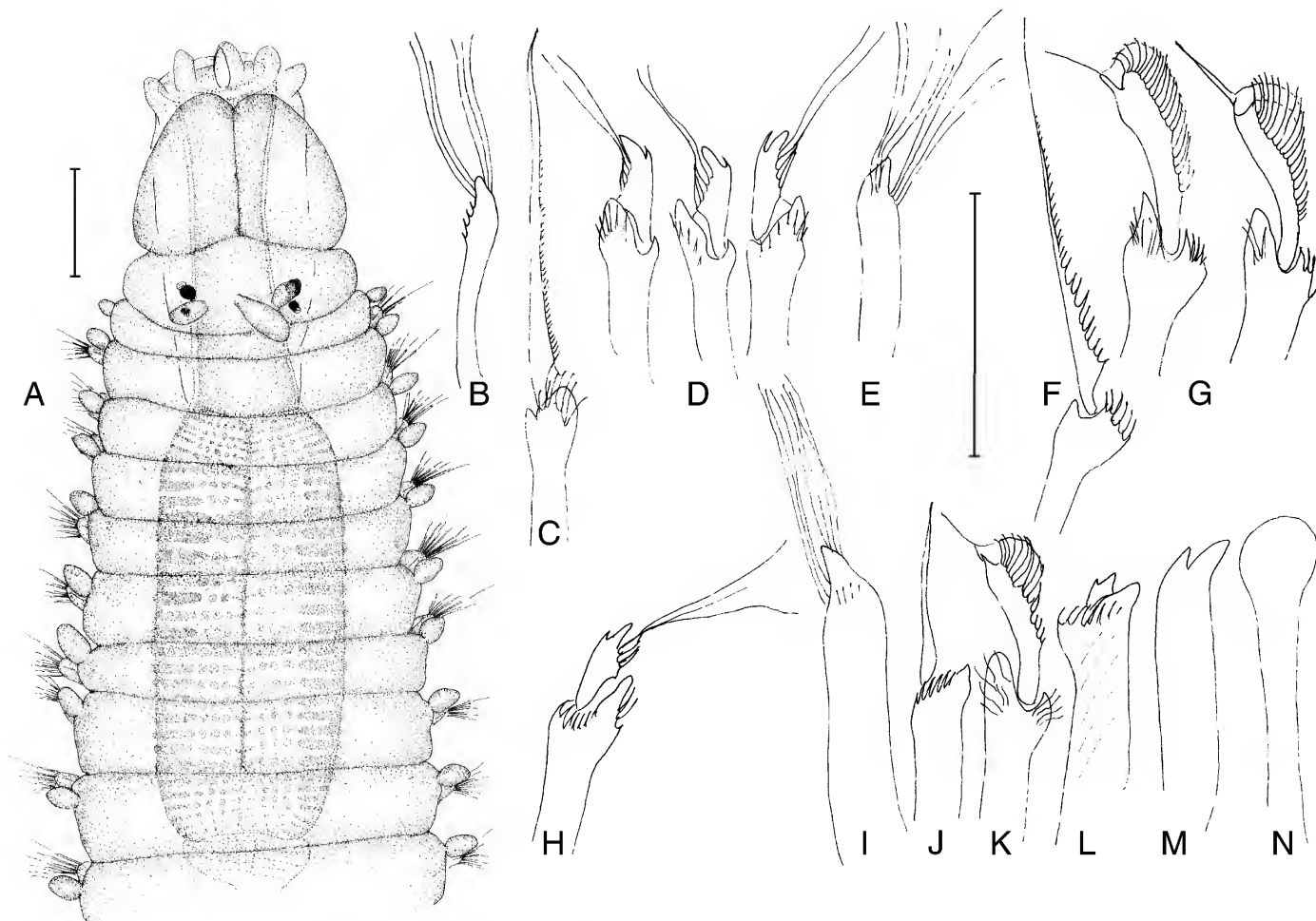


Fig. 83. *Exogone (Exogone) ingridae* n.sp. (A) anterior end, dorsal view. (B) dorsal simple chaeta, anterior parapodium. (C) compound spiniger-like chaeta, anterior parapodium. (D) falcigers, anterior parapodium. (E) dorsal simple chaeta, midbody. (F) spiniger-like chaeta, midbody. (G) modified falcigers, midbody. (H) normal falciger, midbody. (I) dorsal simple chaeta, posterior parapodium. (J) spiniger-like, posterior parapodium. (K) modified falciger, posterior parapodium. (L) normal falciger, posterior parapodium. (M) ventral simple chaeta. (N) acicula. Scale A: 0.1 mm, B–N: 20 µm.

wider than long; 4 eyes in rectangular arrangement. Antennae ovoid, short, inserted separately between posterior eyes; median antenna about twice as long as lateral antennae, much shorter than prostomium; lateral antennae inserted near posterior eyes (Fig. 83A). Palps broad, longer than prostomium, fused along their length, with a distinct dorsal furrow and a terminal notch (Fig. 83A). Tentacular segment about half as long as following segments; tentacular cirri small, shorter than lateral antennae. Dorsal cirri ovoid, longer than tentacular cirri, similar in length to lateral antennae and parapodial lobes. Parapodia of 3 anterior chaetigers each with solitary compound spiniger-like chaeta, shafts with subdistal long, thin spines, and slender, unidentate blade with short marginal spines (Fig. 83C), 30 µm long, and 4 falcigers, shafts provided with subdistal spines and bidentate blades, subdistal tooth long and broad, distal tooth small and long, thin marginal spines, 2 distalmost of which even longer than whole blade, all blades similar in length, about 9 µm long (Fig. 83D). From chaetiger 4 posteriorly, each parapodium with single compound spiniger-like chaeta, similar to those of anterior parapodia but provided with longer spines, both on shafts and blades (Fig. 83F), in addition with 2 strongly modified falcigers, articulation hemigomph with long spines, and blades curved, provided with long, erect spines connected by a membrane, ending in a long, filiform tip (Fig. 83G), and finally one compound falciger, similar to those of anterior parapodia (Fig. 83H). Posterior parapodia each with

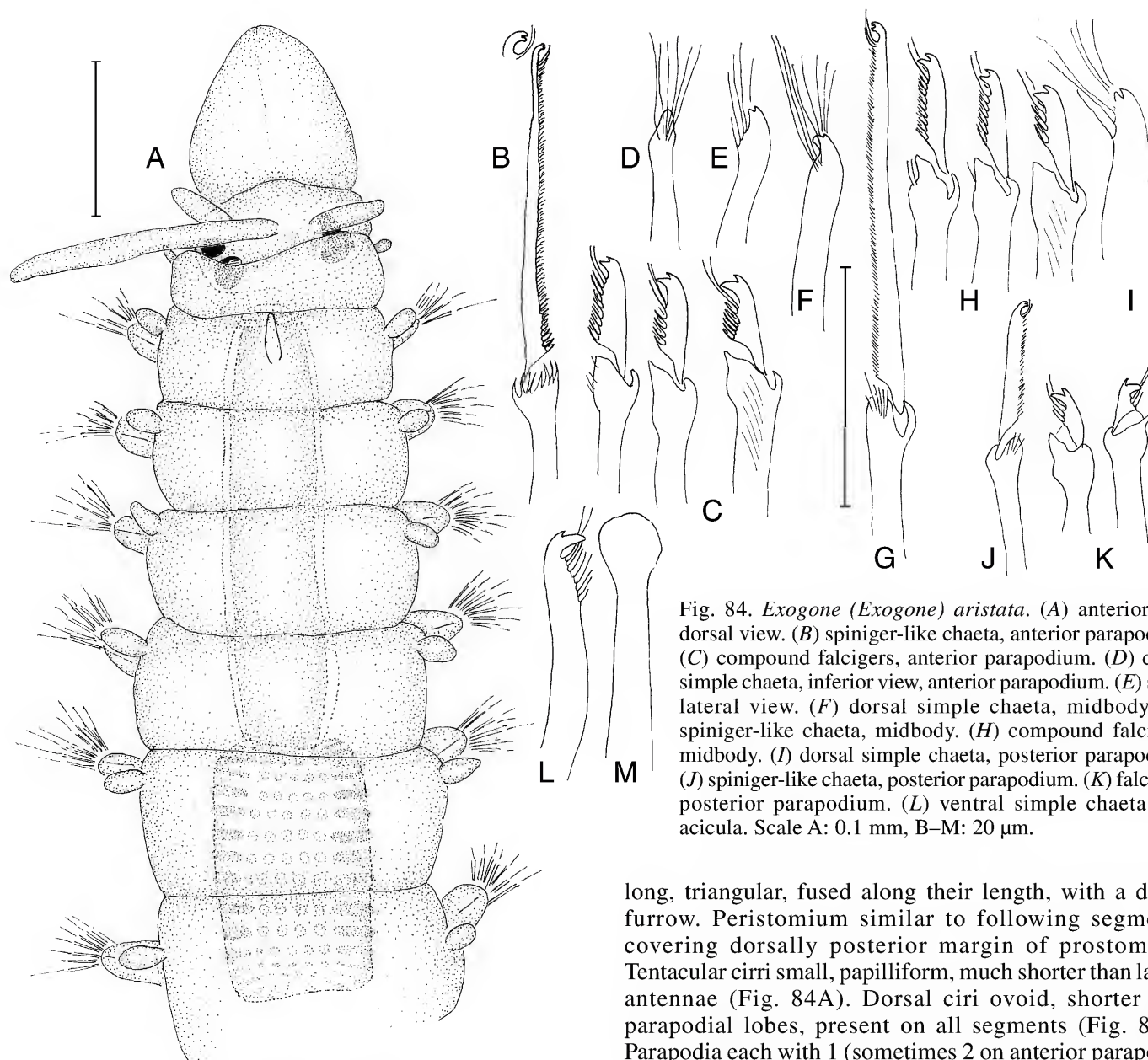
one compound spiniger-like chaeta with thick shaft and short, filiform, smooth blade, about 14–15 µm long (Fig. 83J), one strongly modified falciger similar to those of midbody (Fig. 83K), and one falciger with thick shaft and very short, smooth, bidentate blade (Fig. 83L). Dorsal simple chaetae from anterior segments (chaetiger 3 on holotype), with 6 long subdistal spines (aristae), thicker posteriorly (Figs. 83B,E,I). Ventral simple chaetae on posterior parapodia, sigmoid, thick, smooth, bidentate, subdistal tooth longer and thicker than distal tooth (Fig. 83M). Acicula solitary, distally expanded and rounded (Fig. 83N). Pygidium with 2 long anal cirri. Pharynx long, through about 7 segments, everted in holotype, provided with a crown of 10 soft papillae; pharyngeal tooth on anterior rim (Fig. 83A). Proventricle long, similar in length to pharynx, with about 27 muscle cell rows.

Remarks. This species is unique in having strongly modified compound chaetae on mid and posterior parapodia and long aristae on dorsal simple chaetae as well as on the blades of non-modified falcigers.

Distribution. Australia (New South Wales, Western Australia).

Habitat. On sessile invertebrate substrates such as sponges, bryozoans, dead corals; 12–23 m depth.

Etymology. The species is named in honour of Ms Ingrid Skirka, Sydney, Australia.



Exogone (Exogone) aristata
Hartmann-Schröder, 1982

Fig. 84A–M

Exogone aristata Hartmann-Schröder, 1982: 75, figs. 69–72; 1989: 30.

Material examined. AUSTRALIA: WESTERN AUSTRALIA. 1 specimen, AM W26988, north end of Long Island, 28°27.9'S 113°46.3'E, dead coral algae covered in coralline & brown algae, 6 m, C. Bryce, 22 May 1994. 1 specimen, AM W26989, northeast entrance to Goss Passage, Beacon Island, 28°27.9'S 113°46.7'E, dead *Acropora*, coral substrate covered in algae, 24 m, P.A. Hutchings, 25 May 1994. 3 specimens, AM W26990, off south end of Long Island, Beacon Island, 28°28.8'S 113°46.3'E, dead coral substrate covered in coralline algae, 5 m, P.A. Hutchings, 25 May 1994. 3 specimens, and 1 specimen on SEM stub, AM W27460, inshore reef off Ned's Camp, Cape Range National Park, 21°59'S 113°55'E, green algae, 1.5 m, R.T. Springthorpe, 2 Jan 1984.

Description. Body long and slender, filiform, 2.6 mm long, 0.2 mm wide, 42 chaetigers. Prostomium oval, wider than long; 4 large eyes in trapezoidal arrangement; antennae inserted between anterior eyes; median antenna long, cylindrical, slightly longer than combined length of prostomium and palps, lateral antennae inserted close to eyes, about ¼ of length of median antenna (Fig. 84A). Palps

Fig. 84. *Exogone (Exogone) aristata*. (A) anterior end, dorsal view. (B) spiniger-like chaeta, anterior parapodium. (C) compound falcigers, anterior parapodium. (D) dorsal simple chaeta, inferior view, anterior parapodium. (E) same, lateral view. (F) dorsal simple chaeta, midbody. (G) spiniger-like chaeta, midbody. (H) compound falcigers, midbody. (I) dorsal simple chaeta, posterior parapodium. (J) spiniger-like chaeta, posterior parapodium. (K) falcigers, posterior parapodium. (L) ventral simple chaeta. (M) acicula. Scale A: 0.1 mm, B–M: 20 µm.

long, triangular, fused along their length, with a dorsal furrow. Peristomium similar to following segments, covering dorsally posterior margin of prostomium. Tentacular cirri small, papilliform, much shorter than lateral antennae (Fig. 84A). Dorsal cirri ovoid, shorter than parapodial lobes, present on all segments (Fig. 84A). Parapodia each with 1 (sometimes 2 on anterior parapodia) compound chaetae hemigomph, distally spinose, with spiniger-like blade, distally curved, bifid, with short marginal spines, except 2–3 distalmost ones which are longer and erect, extending beyond tip (Figs. 84B,G,J); in addition compound falcigers 5–6 on anterior parapodia diminishing to 3 on posterior parapodia, with subdistal tooth long and broad and short distal tooth, moderate marginal spines, except 2–3 distalmost ones, long, erect, extending beyond tip (Figs. 84C,H,K); blades both of spiniger-like chaetae and falcigers provided with several rows of marginal spines. Blades of spiniger-like chaetae about 28 µm on anterior parapodia, 37 µm on midbody, 12 µm on posterior parapodia. Blades of falcigers about 10 µm on anterior parapodia, 16–18 µm on midbody, 4–5 µm on posterior parapodia. Dorsal simple chaetae from post-proventricular parapodia, distally bidentate, thicker posteriorly, with 6–8 long, thin spines (aristae) (Figs. 84D,E,F,I). Ventral simple chaetae on posterior parapodia, sigmoid, bidentate, with long subdistal tooth and short distal tooth, provided with several long subdistal spines, 2 distalmost ones much longer than other spines, erect, extending beyond tip of chaeta (Fig. 84L). Acicula solitary, slender, distally expanded and rounded (Fig. 84M). Pharynx long and slender, through about 4 segments; pharyngeal tooth on anterior rim (Fig.

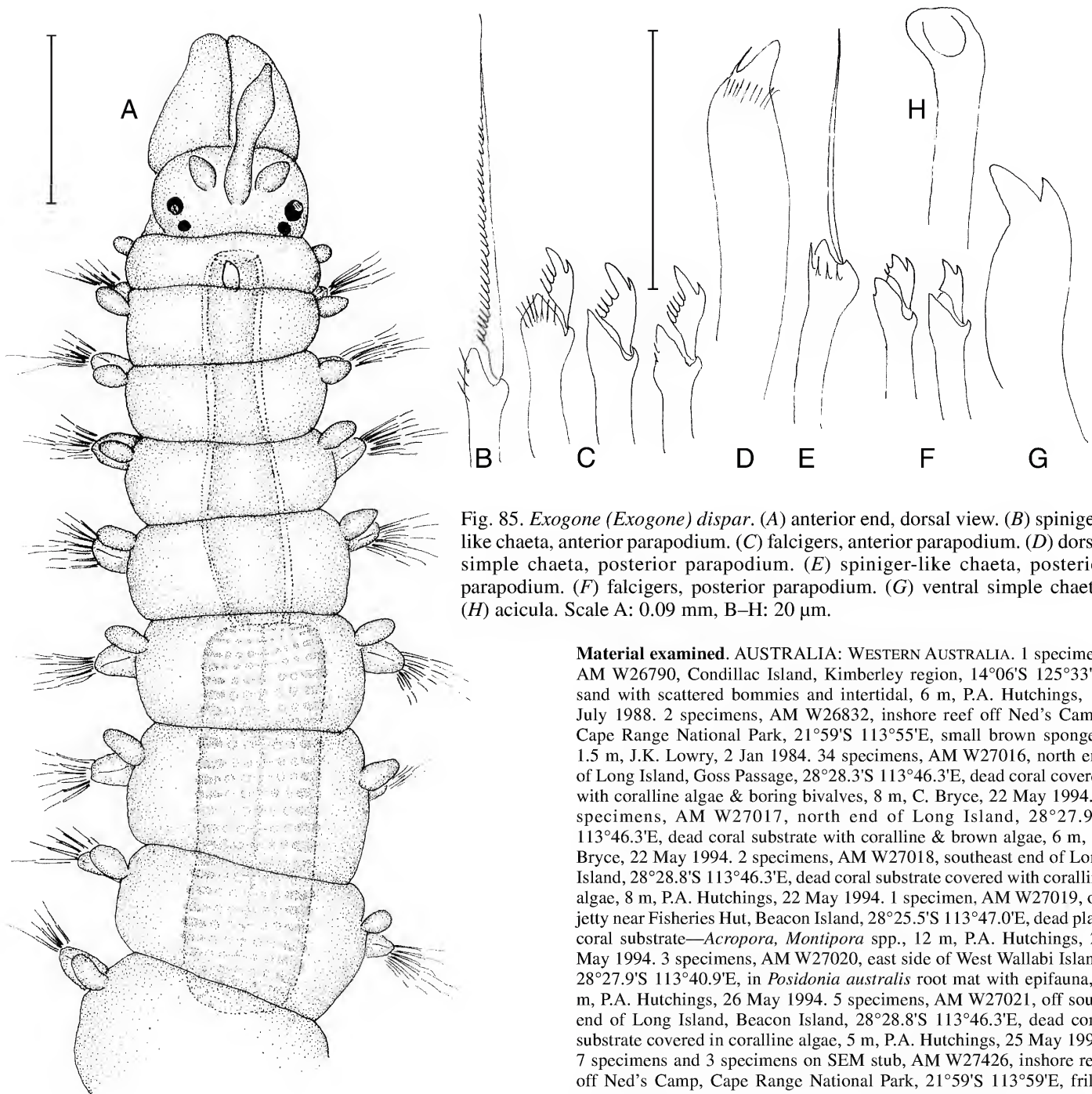


Fig. 85. *Exogone (Exogone) dispar*. (A) anterior end, dorsal view. (B) spiniger-like chaeta, anterior parapodium. (C) falcigers, anterior parapodium. (D) dorsal simple chaeta, posterior parapodium. (E) spiniger-like chaeta, posterior parapodium. (F) falcigers, posterior parapodium. (G) ventral simple chaeta. (H) acicula. Scale A: 0.09 mm, B–H: 20 µm.

84A). Proventricle short, through 1½–2 segments, with about 15 muscle cell rows. Pygidium with 2 long anal cirri.

Distribution. Australia (New South Wales, Western Australia).

Habitat. Amongst *Posidonia* and algae, in dead corals; intertidal to about 24 m depth.

***Exogone (Exogone) dispar* (Webster, 1879)**

Figs. 81F, 85A–G

Paedophylax dispar Webster, 1879: 223, pl. 4, fig. 49, pl. 5, figs. 50–55.

Exogone dispar.—Westheide, 1974: 298, figs. 48, 49; Perkins, 1981: 1090; Uebelacker, 1984: 30–43, fig. 30–36; Campoy, 1982: 290, pl. 21; San Martín, 1984a: 221, pl. 52; Fan *et al.*, 1993: 25, fig. 5.

Exogone (Exogone) dispar.—San Martín, 1991a: 729; 2003: 274, figs. 149, 150; Ruíz-Ramírez & Salazar-Vallejo, 2001: 127, fig. 3 (45–54).

Material examined. AUSTRALIA: WESTERN AUSTRALIA. 1 specimen, AM W26790, Condillac Island, Kimberley region, 14°06'S 125°33'E, sand with scattered bommies and intertidal, 6 m, P.A. Hutchings, 16 July 1988. 2 specimens, AM W26832, inshore reef off Ned's Camp, Cape Range National Park, 21°59'S 113°55'E, small brown sponges, 1.5 m, J.K. Lowry, 2 Jan 1984. 34 specimens, AM W27016, north end of Long Island, Goss Passage, 28°28.3'S 113°46.3'E, dead coral covered with coralline algae & boring bivalves, 8 m, C. Bryce, 22 May 1994. 7 specimens, AM W27017, north end of Long Island, 28°27.9'S 113°46.3'E, dead coral substrate with coralline & brown algae, 6 m, C. Bryce, 22 May 1994. 2 specimens, AM W27018, southeast end of Long Island, 28°28.8'S 113°46.3'E, dead coral substrate covered with coralline algae, 8 m, P.A. Hutchings, 22 May 1994. 1 specimen, AM W27019, off jetty near Fisheries Hut, Beacon Island, 28°25.5'S 113°47.0'E, dead plate coral substrate—*Acropora*, *Montipora* spp., 12 m, P.A. Hutchings, 23 May 1994. 3 specimens, AM W27020, east side of West Wallabi Island, 28°27.9'S 113°40.9'E, in *Posidonia australis* root mat with epifauna, 2 m, P.A. Hutchings, 26 May 1994. 5 specimens, AM W27021, off south end of Long Island, Beacon Island, 28°28.8'S 113°46.3'E, dead coral substrate covered in coralline algae, 5 m, P.A. Hutchings, 25 May 1994. 7 specimens and 3 specimens on SEM stub, AM W27426, inshore reef off Ned's Camp, Cape Range National Park, 21°59'S 113°59'E, frilly *Caulerpa* sp., 1 m, J.K. Lowry, 2 Jan 1984. 1 specimen, AM W27428, inshore reef off Ned's Camp, Cape Range National Park, 21°59'S 113°55'E, coral rubble covered with algae, 1.5 m, J.K. Lowry, 2 Jan 1984. 6 specimens, AM W27454, north end of beach, Bundegi Reef, Exmouth Gulf, 21°49'S 114°11'E, rocky rubble, coralline algae with green epiphyte, 2 m, H.E. Stoddart, 4 Jan 1984. 30 specimens, AM W27644, north end of beach, Bundegi Reef, Exmouth Gulf, 21°49'S 114°11'E, rocky rubble, brown algae with epiphytes, sediment, 2 m, H.E. Stoddart, 4 Jan 1984.

Description. Body long, slender, filiform, 5 mm long, 0.25 mm wide, 35 chaetigers. Prostomium rounded to oval; 4 eyes in trapezoidal arrangement. Antennae inserted close to each other approximately on middle of prostomium, anteriorly to line between anterior eyes (Fig. 85A); median antenna distinctly longer than lateral antennae, shorter than prostomium and palps together, with a subdistal enlargement; lateral antennae ovate, ⅓ or less than median antenna. Palps broad, fused all along their length, with a dorsal furrow and distal notch, similar in length to prostomium (Figs. 81F, 85A). Peristomium similar in length to following segments; tentacular cirri small, ovoid. Dorsal cirri ovoid, similar to

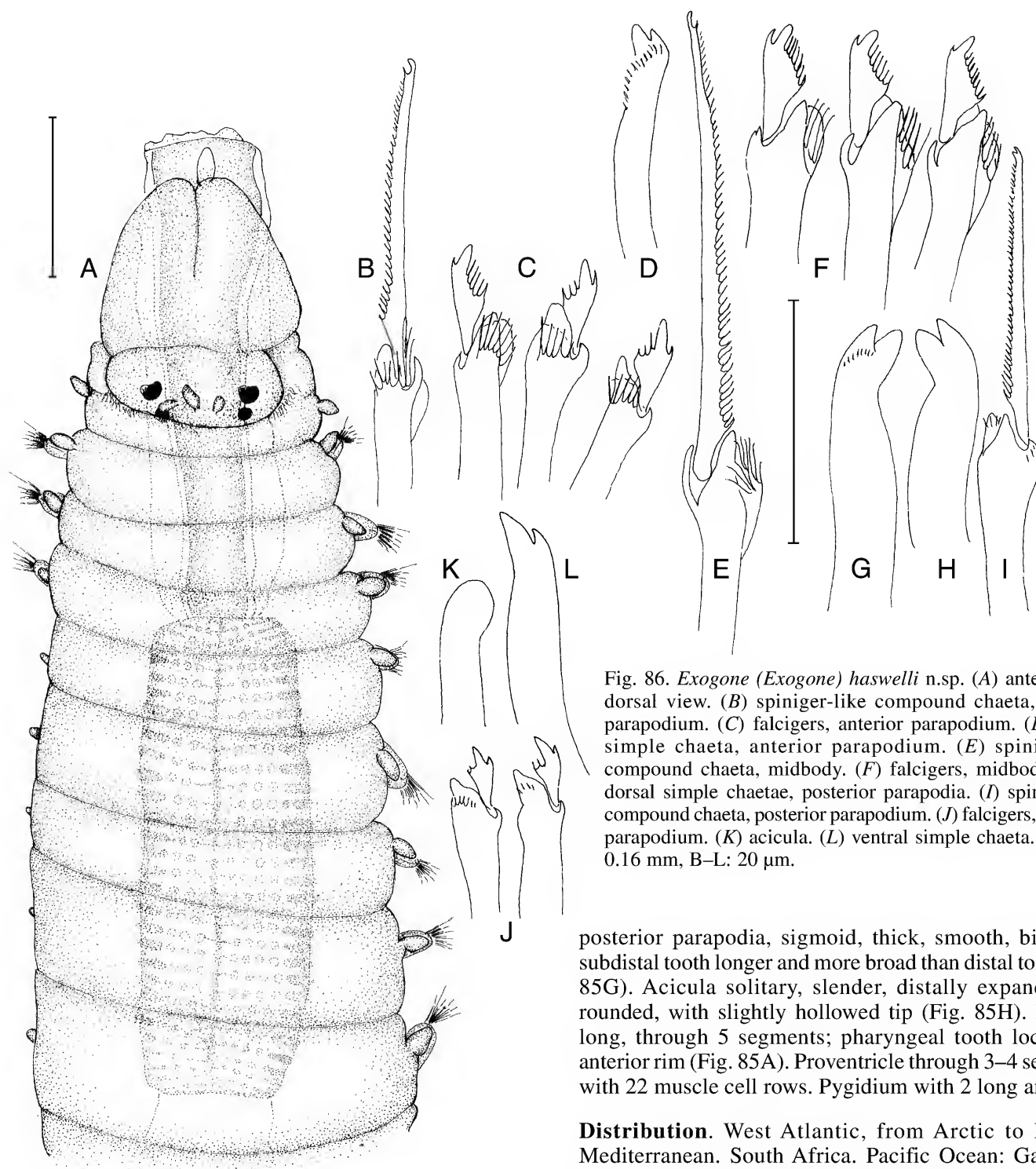


Fig. 86. *Exogone (Exogone) haswelli* n.sp. (A) anterior end, dorsal view. (B) spiniger-like compound chaeta, anterior parapodium. (C) falcigers, anterior parapodium. (D) dorsal simple chaeta, anterior parapodium. (E) spiniger-like compound chaeta, midbody. (F) falcigers, midbody. (G, H) dorsal simple chaetae, posterior parapodia. (I) spiniger-like compound chaeta, posterior parapodium. (J) falcigers, posterior parapodium. (K) acicula. (L) ventral simple chaeta. Scale A: 0.16 mm, B–L: 20 µm.

posterior parapodia, sigmoid, thick, smooth, bidentate, subdistal tooth longer and more broad than distal tooth (Fig. 85G). Acicula solitary, slender, distally expanded and rounded, with slightly hollowed tip (Fig. 85H). Pharynx long, through 5 segments; pharyngeal tooth located on anterior rim (Fig. 85A). Proventricle through 3–4 segments, with 22 muscle cell rows. Pygidium with 2 long anal cirri.

Distribution. West Atlantic, from Arctic to Florida. Mediterranean. South Africa. Pacific Ocean: Galápagos Islands, Japan, Australia (Western Australia).

Habitat. Sediments, from mud to coarse sand, broken shells, inside corals, amongst algae and seagrasses; intertidal and shallow waters.

***Exogone (Exogone) haswelli* n.sp.**

Fig. 86A–L

Material examined. AUSTRALIA: NEW SOUTH WALES. HOLOTYPE: AM W26443, Palm Beach, Pittwater, 33°35'S 151°19'E, sand, seagrass, *Halophila* & *Posidonia*, 3 m, J.K. Lowry & R.T. Springthorpe, 28 Apr 1983. PARATYPES: 20 specimens, AM W26444, Palm Beach, Pittwater, 33°35'S 151°19'E, sand, seagrass, *Halophila* & *Posidonia*, 3 m, J.K. Lowry & R.T. Springthorpe, 28 Apr 1983. WESTERN AUSTRALIA. 2 specimens, and 2 specimens on SEM stub, AM W27456, north end of beach, Bundegi Reef, Exmouth Gulf, 21°49'S 114°11'E, rocky rubble, coralline algae with green epiphyte, 2 m, H.E. Stoddart, 4 Jan 1984.

tentacular cirri but longer, similar to lateral antennae or slightly shorter, present on all parapodia (Figs. 81F, 85A). Anterior parapodia each with 1–2 compound chaetae with unidentate, filiform spiniger-like blades, with short marginal spines (Fig. 85B), about 28–29 µm long; in addition 5–6 compound chaetae with falcigerous blades, bidentate, subdistal tooth long and distal tooth short and moderate marginal spines (Fig. 85C), about 8 µm long. Decreasing number of compound chaetae posteriorly to 1 spiniger-like and 2 falcigers; posterior compound chaetae less spinulated, both on shafts and blades (Fig. 85E, F); blades of spiniger-like chaetae about 18 µm and those of falcigers about 4–5 µm long. Dorsal simple chaetae from anterior segments (4–5), with rounded tips and finely spinulose subterminally, thicker posteriorly (Fig. 85D). Ventral simple chaetae on

Description. Body long, slender, filiform, 4.6 mm long, 0.3 mm wide, 54 chaetigers. Prostomium oval, wider than long; 4 eyes in trapezoidal to rectangular arrangement. Antennae minute, papilliform, inserted between posterior pair of eyes, close to each other but distinctly separate (Fig. 86A), all similar, difficult to see. Palps broad, long, about twice as long as prostomium, with a dorsal furrow and a distal notch. Peristomium shorter than following segments, laterally and ventrally expanded at anterior end, surrounding prostomium (Fig. 86A); tentacular cirri small, ovoid to papilliform, similar in shape and size to antennae. Two ciliated, distinct nuchal organs. Dorsal cirri ovoid, slightly longer than antennae and tentacular cirri, present on all parapodia (Fig. 86A). Parapodia each with solitary compound chaetae with spiniger-like blade and several falcigers, 3–4 anteriorly to 2 on each posterior parapodia. Spiniger-like chaetae with hemigomph shafts, provided with a distal longitudinal keel with long, thin spines and elongate blades bidentate and short marginal spines (Figs. 86B,E,I), about 28 µm in length on anterior parapodia, 39 µm in midbody, 24 µm on posterior parapodia. Falcigers heterogomph, shafts with a ridge with long, slender spines on anterior and midbody parapodia (Fig. 86C,F), blades with long, thick subdistal tooth and short, small distal tooth, provided with moderate to short marginal spines, 10 µm long on midbody, about 6 µm long on posterior parapodia (Fig. 86J). Dorsal simple chaetae from chaetiger 6 in holotype, distinctly bidentate, with broad teeth and subdistal spines on anterior parapodia (Fig. 86D), progressively thicker, more strongly bidentate with broader teeth, with few short spines (Fig. 86G) or smooth (Fig. 86H). Ventral simple chaetae from midbody, sigmoid, smooth, bidentate, subdistal tooth long and broad, distal tooth much smaller (Fig. 86L). Acicula solitary, distally rounded (Fig. 86K). Pharynx long and slender, through 7 segments; pharyngeal tooth conical, near anterior rim (Fig. 86A). Proventricle long and slender through about 5–6 segments, with 30 muscle cell rows.

Remarks. *Exogone (Exogone) haswelli* n.sp. is characterized by having minute, papilliform antennae, long proventricle and strongly bidentate dorsal simple chaetae. Similar dorsal simple chaetae are present in *Exogone (E.) pseudolourei* San Martín, 1991, from the Caribbean Sea, but that species has much longer antennae, especially the median one, much shorter proventricle and enlarged, shafts with a triangular process, on spiniger-like compound chaetae of chaetiger 2 (San Martín, 1991a).

Distribution. Australia (New South Wales, Western Australia).

Habitat. Sand and seagrass, amongst coralline algae, in shallow water.

Etymology. The species is named in honour of the late Professor William Haswell, the first Australian polychaetologist, and one who contributed substantially to our knowledge of the Australian Syllidae.

Exogone (Exogone) koorenborongi n.sp.

Fig. 87A–K

Material examined. AUSTRALIA: WESTERN AUSTRALIA. HOLOTYPE: AM W26617, south east end of Long Island, Goss Passage, 28°28.8'S 113°46.5'E, dead coral covered in coralline algae, 8 m, P.A. Hutchings, 22 May 1994. PARATYPES: 2 specimens, AM W26618, south east end of Long Island, Goss Passage, 28°28.8'S 113°46.5'E, dead coral covered in coralline algae, 8 m, P.A. Hutchings, 22 May 1994. PARATYPE: 1 specimen, AM W26619, south east end of Long Island, Goss Passage, 28°28.8'S 113°46.5'E, dead coral covered in coralline algae, 8 m, P.A. Hutchings, 22 May 1994.

Description. Body small, slender, filiform, 3.3 mm long, 0.14 mm wide, 29 chaetigers; lateral lobes of nuchal organs usually dark to black, distinct (Fig. 87A). Prostomium oval; 4 eyes in trapezoidal to rectangular arrangement; antennae minute, inserted close to each other near anterior margin of prostomium, ovoid, median antenna slightly longer than lateral antennae (Fig. 87A). Palps broad, longer than prostomium, fused along their length, with a distinct dorsal furrow, with distal notch (Fig. 87A). Peristomium small, dorsally covered by chaetiger 1; tentacular cirri similar both in shape and length to antennae. Dorsal cirri ovoid, longer than antennae, shorter than parapodial lobes or similar in length, present on all segments (Fig. 87A). Anterior parapodia each with 1 compound chaeta, shaft distally provided with long spines of which one distinctly longer, and short, smooth, unidentate blade, about 18 µm long (Fig. 87D); in addition 3 falcigers with spinose shafts and short, smooth blades, with distal tooth indistinct and long subdistal tooth (Fig. 87E), about 4–5 µm long. Midbody parapodia each with solitary compound spiniger-like chaeta, similar to those of anterior parapodia (Fig. 87F), and 2 compound falcigers with spinose shafts, one spine longer than others, and blades short, usually one of them provided with very small distal tooth and one without distal tooth (Fig. 87G). Posterior parapodia each with a single spiniger-like compound chaeta, similar to those of midbody (Fig. 87J) and solitary compound falciger, with blade short, smooth and without distal tooth (Fig. 87K). Dorsal simple chaetae from anterior parapodia, with rounded tips and finely spinulose subterminally, thicker posteriorly (Fig. 87C,H). Ventral simple chaetae on posterior parapodia, thick, sigmoid, bidentate, subdistal tooth long and broad, distal tooth small (Fig. 87I). Pygidium semi-circular, with 2 short anal cirri, longer than dorsal cirri (Fig. 87B) and a distal papilla. Pharynx through 2 segments; pharyngeal tooth on anterior rim (Fig. 87A). Proventricle small, occupying only one segment, nearly rounded, with about 12 muscle cell rows.

Remarks. This species is characterized by its small size, minute, papilliform antennae located on anterior margin of prostomium and short proventricle. The dark lateral lobes of the nuchal organs (see Lewbart & Riser, 1996) are more distinct in some specimens and almost indistinct in others.

Exogone (E.) koorenborongi n.sp. is similar to *Exogone (E.) goorapuranga*, described above; that species, however, has a longer median antenna, lacks spiniger-like compound chaetae on anteriormost parapodia, and the chaetae, both compound and simple, are different. Also *Exogone (E.) koorenborongi* is similar to *Exogone (E.) naidina*, and it is possible that some records of that species in Australia should be referred to *Exogone (E.) koorenborongi*.

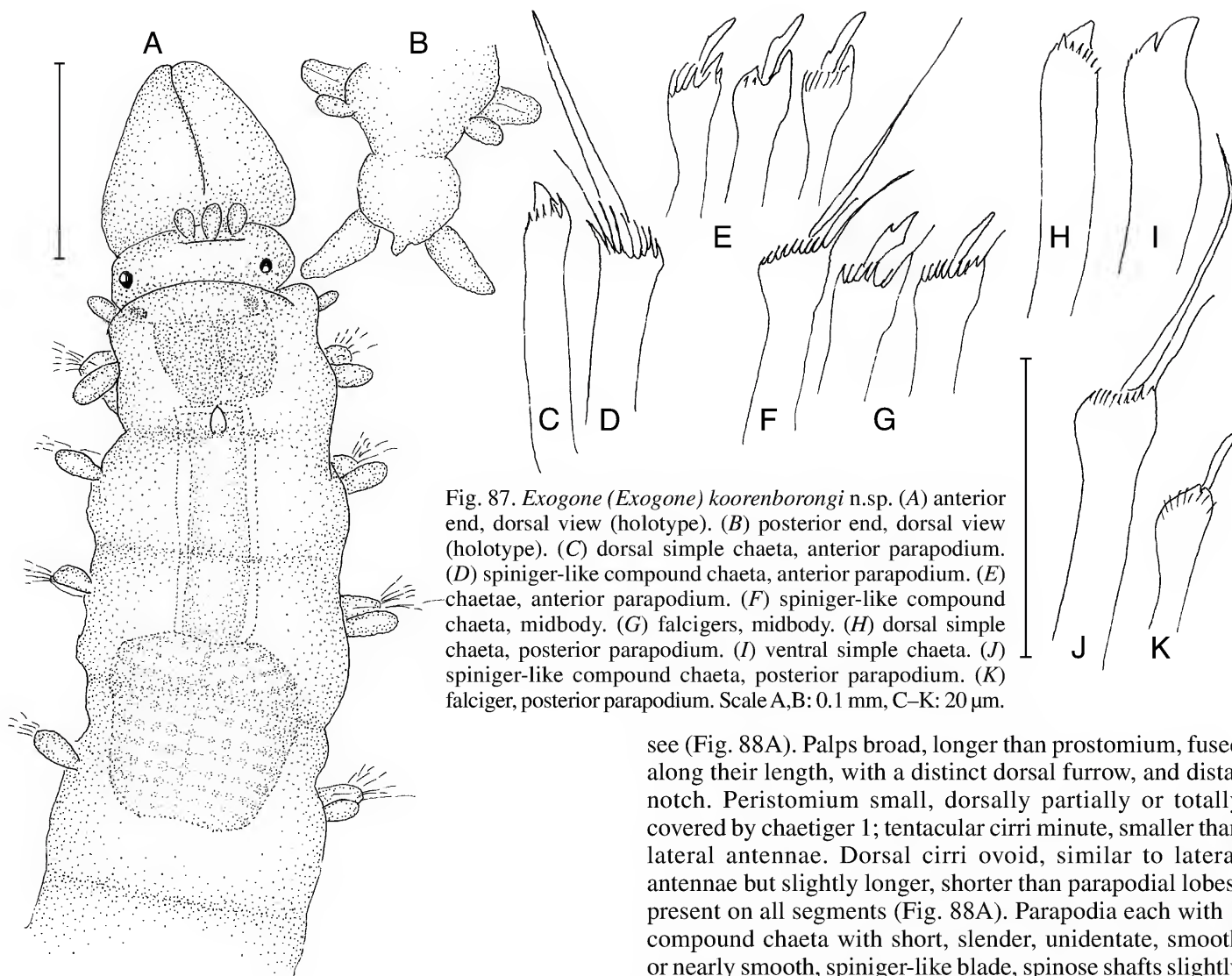


Fig. 87. *Exogone (Exogone) koorenborongi* n.sp. (A) anterior end, dorsal view (holotype). (B) posterior end, dorsal view (holotype). (C) dorsal simple chaeta, anterior parapodium. (D) spiniger-like compound chaeta, anterior parapodium. (E) chaetae, anterior parapodium. (F) spiniger-like compound chaeta, midbody. (G) falcigers, midbody. (H) dorsal simple chaeta, posterior parapodium. (I) ventral simple chaeta. (J) spiniger-like compound chaeta, posterior parapodium. (K) falciger, posterior parapodium. Scale A,B: 0.1 mm, C-K: 20 µm.

Distribution. Australia (Western Australia).

Habitat. Inside dead corals, 8–30 m depth.

Etymology. The specific name comes from combining two Aboriginal words: *kooren* meaning neck, and *borongi* meaning dark, in reference to the dark lobes of the nuchal organs.

***Exogone (Exogone) brevifalcigera*
Hartmann-Schröder, 1990**

Fig. 88A–M

Exogone brevifalcigera Hartmann-Schröder, 1990: 56, figs. 24–26.

Material examined. AUSTRALIA: NEW SOUTH WALES. PARATYPES: 2 specimens, AM W203314, Angourie Point, Maclean, 29°21'S 154°22'E, 0 m, Hartmann-Schröder, 17 Jan 1976. 1 specimen, AM W26398, South Ledge, Cook Island, 28°11.65'S 153°34.63'E, rock, 15 m, K.B. Attwood, 9 Jun 1993. 1 specimen, AM W26399, Split Solitary Island, 30°15'S 153°11'E, 17 m.

Description. Body small, slender, relatively broad, 2.9 mm long, 0.4 mm wide, 38 chaetigers; holotype slightly longer, 3.2 mm long, 38 chaetigers. Prostomium rectangular to oval; 4 eyes in trapezoidal arrangement; anterior eyespots not seen. Antennae small, inserted close to each other, approximately on middle of prostomium; median antenna about twice as long as the lateral antennae, slightly pyriform, shorter than prostomium; lateral antenna ovoid, difficult to

see (Fig. 88A). Palps broad, longer than prostomium, fused along their length, with a distinct dorsal furrow, and distal notch. Peristomium small, dorsally partially or totally covered by chaetiger 1; tentacular cirri minute, smaller than lateral antennae. Dorsal cirri ovoid, similar to lateral antennae but slightly longer, shorter than parapodial lobes, present on all segments (Fig. 88A). Parapodia each with 1 compound chaeta with short, slender, unidentate, smooth or nearly smooth, spiniger-like blade, spinose shafts slightly different on midbody and posterior segments (Figs. 88C,G,K); in addition 5 falcigers on anterior parapodia reduced to only 2 on posterior parapodia; falcigers with distally spinose shafts and minute, sometimes indistinct, smooth, bidentate blades with subdistal tooth longer than distal tooth (Figs. 88E,H,L), slightly longer on anterior parapodia, about 5 µm, than on posterior ones, 3 µm long. Dorsal simple chaetae from anterior parapodia, with rounded tips and finely spinulose subterminally, slender on anterior parapodia (Fig. 88D), thicker, unidentate, with less spines posteriorly (Fig. 88F,J). Ventral simple chaetae on posterior parapodia, sigmoid, unidentate, provided with short, small spines above (Fig. 88M). Acicula solitary, distally rounded (Fig. 88I). Pygidium semi-circular, with 2 long anal cirri (Fig. 88B). Pharynx through 4–5 segments; pharyngeal tooth conical, acute, long, longer than median antenna (Fig. 88A). Proventricle through 4–5 segments, with about 21 muscle cell rows.

Remarks. *Exogone (E.) marisae* Pascual, Núñez & San Martín, 1996, from Canary Islands have the falcigers similar, with short blades, encased in spinose shafts, but the antennae are inserted more anteriorly on the prostomium, the proventricle is shorter, and the dorsal simple chaetae have aristae (Pascual *et al.*, 1996).

Distribution. Australia (New South Wales).

Habitat. On shallow hard substrates.

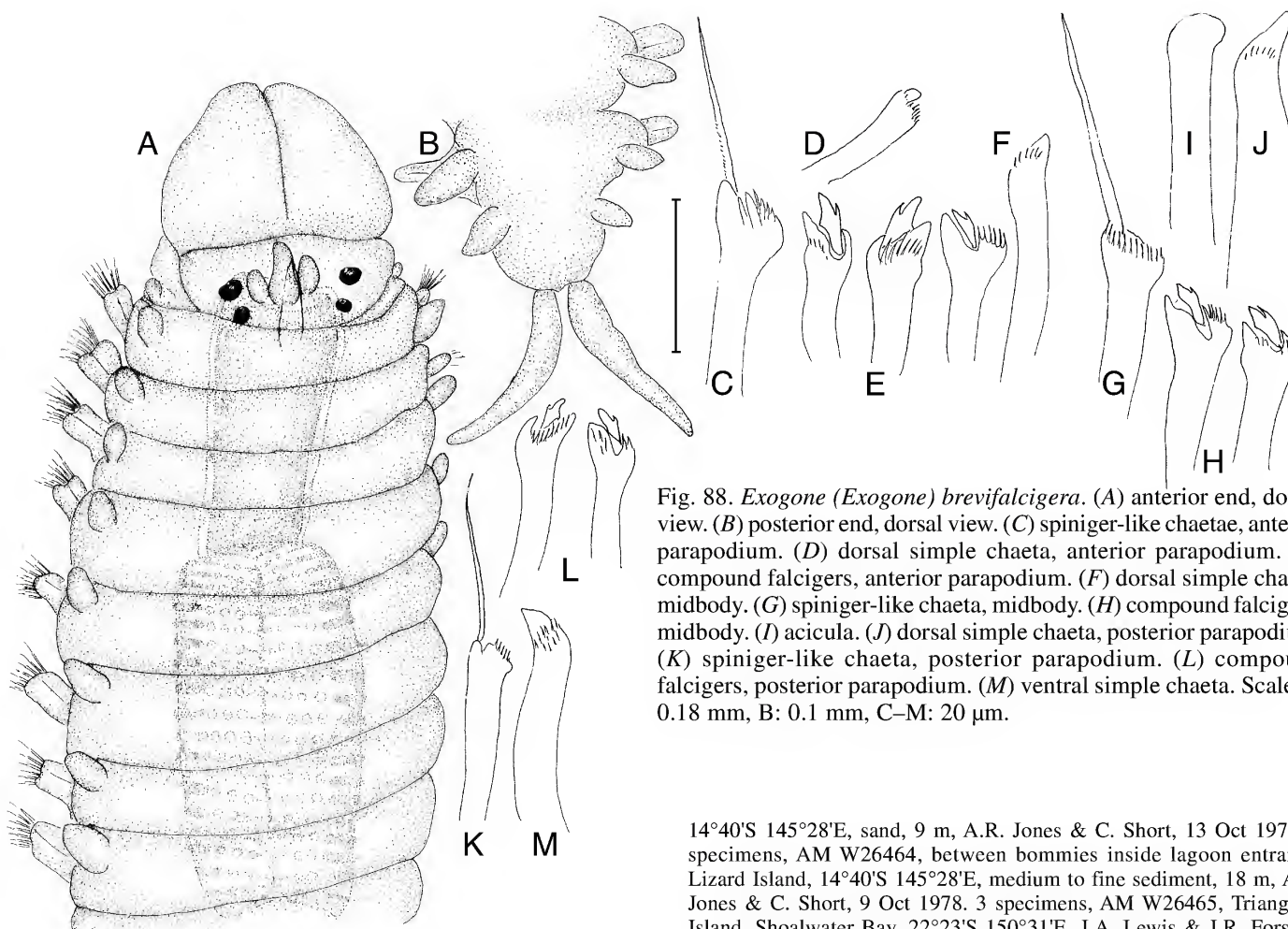


Fig. 88. *Exogone (Exogone) brevifalcigera*. (A) anterior end, dorsal view. (B) posterior end, dorsal view. (C) spiniger-like chaetae, anterior parapodium. (D) dorsal simple chaeta, anterior parapodium. (E) compound falcigers, anterior parapodium. (F) dorsal simple chaeta, midbody. (G) spiniger-like chaeta, midbody. (H) compound falcigers, midbody. (I) acicula. (J) dorsal simple chaeta, posterior parapodium. (K) spiniger-like chaeta, posterior parapodium. (L) compound falcigers, posterior parapodium. (M) ventral simple chaeta. Scale A: 0.18 mm, B: 0.1 mm, C–M: 20 μ m.

***Exogone (Exogone) breviantennata*
Hartmann-Schröder, 1959**

Figs. 81E, 89A–I

Exogone breviantennata Hartmann-Schröder, 1959: 125, figs. 75–78; Zottoli & Long, 2000: 502, figs. 1–5.

Exogone (Exogone) breviantennata.—San Martín, 1991a: 730, fig. 8; Pascual *et al.*, 1996: 70.

Exogone ovalis Hartmann-Schröder, 1960: 106, figs. 131–133.

Exogone breviantennata ovalis Hartmann-Schröder, 1974c: 28.

Exogone occidentalis Westheide, 1974: 305, fig. 52; Russell, 1991: 59, fig. 4.

Exogone verugera.—Not Claparède, 1868; Haswell, 1920a: 219, pl. 17, figs. 7–10; Berkeley & Berkeley, 1948: 78, fig. 116; Day, 1967: 272, fig. 12.10 g–l; Gardiner, 1976: 132, fig. 11 a–e; Imajima, 1966: 399, fig. 3; Rioja, 1943: 221, figs. 12–16.

Material examined. AUSTRALIA: QUEENSLAND. 1 specimen, AM W26456, 100 m off Mangrove Beach, Lizard Island, 14°40'S 145°28'E, medium grained sediment, 3 m, A.R. Jones & C. Short, 13 Oct 1978, B3–3. 4 specimens, AM W26457, lagoon entrance, Lizard Island, 14°40'S 145°28'E, medium to fine sediment, 18 m, A.R. Jones & C. Short, 9 Oct 1978. 3 specimens, AM W26458, 100 m off Mangrove Beach, Lizard Island, 14°40'S 145°28'E, medium sediment, 3 m, A. Jones & C. Short, 13 Oct 1978. 1 specimen, AM W26459, Lizard Island, 14°40'S 145°28'E, A.R. Jones & C. Short, Oct 1978. 1 specimen, AM W26460, 600 m southwest of Research Point, Lizard Island, 14°40'S 145°28'E, coarse to medium grained sediment, 4.5 m, A.R. Jones, C. Short, 10 Oct 1978. 2 specimens, AM W26461, 100 m off Mangrove Beach, Lizard Island, 14°40'S 145°28'E, coarse to medium sediment, 3 m, A.R. Jones & C. Short, 13 Oct 1978. 3 specimens, AM W26462, between bommies inside lagoon entrance, Lizard Island, 14°40'S 145°28'E, medium to fine sediment, 18 m, A.R. Jones & C. Short, 9 Oct 1978. 1 specimen, AM W26463, 100 m off Chinamans Ridge, Watsons Bay, Lizard Island,

14°40'S 145°28'E, sand, 9 m, A.R. Jones & C. Short, 13 Oct 1978. 2 specimens, AM W26464, between bommies inside lagoon entrance, Lizard Island, 14°40'S 145°28'E, medium to fine sediment, 18 m, A.R. Jones & C. Short, 9 Oct 1978. 3 specimens, AM W26465, Triangular Island, Shoalwater Bay, 22°23'S 150°31'E, J.A. Lewis & J.R. Forsyth, 1981. 4 specimens, AM W26466, Triangular Island, Shoalwater Bay, 22°23'S 150°31'E, J.A. Lewis & J.R. Forsyth, 1981. WESTERN AUSTRALIA. 2 specimens, AM W26804, north end of beach, Bundegi Reef, Exmouth Gulf, 21°49'S 114°11'E, rocky rubble, coralline algae with green epiphyte, 2 m, H.E. Stoddart, 4 Jan 1984. 1 specimen, AM W27000, Goss Passage, Beacon Island, 28°25.5'S 113°47.0'E, dead branching coral covered with coralline algae, 10 m, P.A. Hutchings, 18 May 1994. 7 specimens, AM W27001, Goss Passage, Beacon Island, 28°25.5'S 113°47.0'E, dead *Acropora* plates covered in sponges, ascidians & algae, 23 m, P.A. Hutchings, 19 May 1994. 16 specimens, AM W27002, Goss Passage, Beacon Island, 28°25.5'S 113°47.0'E, dead *Acropora* plates covered in coralline algae, 8 m, P.A. Hutchings, 19 May 1994. 6 specimens, AM W27003, Goss Passage, Beacon Island, 28°25.5'S 113°47.0'E, dead *Acropora* plates covered in coralline algae, 20 m, P.A. Hutchings, 20 May 1994. 4 specimens, AM W27004, Goss Passage, Beacon Island, 28°25.5'S 113°47.0'E, dead coral plates covered in coralline algae, 8 m, P.A. Hutchings, 22 May 1994. 3 specimens, AM W27005, north end of Long Island, Goss Passage, 28°28.3'S 113°46.3'E, dead coral covered with coralline algae & boring bivalves, 8 m, C. Bryce, 22 May 1994. 2 specimens, AM W27006, off jetty near Fisheries Hut, Beacon Island, 28°25.5'S 113°47.0'E, dead plate coral substrate—*Acropora*, *Montipora* spp., 12 m, P.A. Hutchings, 23 May 1994. 5 specimens, AM W27007, east side of West Wallabi Island, 28°27.9'S 113°40.9'E, in *Posidonia australis* root mat, with epifauna, 2 m, P.A. Hutchings, 26 May 1994. 3 specimens, AM W27008, northeast entrance to Goss Passage, Beacon Island, 28°27.9'S 113°46.7'E, dead branching *Acropora* with coralline and brown algae, 24 m, P.A. Hutchings, 25 May 1994. 9 specimens, AM W27009, northeast entrance to Goss Passage, Beacon Island, 28°27.9'S 113°46.7'E, dead plate coral covered with coralline algae, 8 m, P.A. Hutchings, 25 May 1994. 1 specimen, AM W27010, Wallabi Island group, 28°34.65'S 113°46.46'E, coral rubble & sponges, 49 m, P.A. Hutchings on FRV "Flinders", 28 Jun 1994. 2 specimens, AM W27011, East Montlivet Island, 15°06'S 125°18'E, 6 m, P.A. Hutchings, 16 July 1988. 11 specimens, and 2 specimens on SEM stub, AM W27433, north end of beach, Bundegi Reef, Exmouth Gulf, 21°49'S 114°11'E, rocky rubble, brown algae with epiphytes, sediment, 2 m, H.E. Stoddart, 4 Jan 1984. 1 specimen, AM W27443, Bush Bay, 30 km south of Carnarvon, 25°10'S 113°39'E, shallow sand flats, 0.5 m, J.K. Lowry and H.E. Stoddart, 6 Jan 1984.

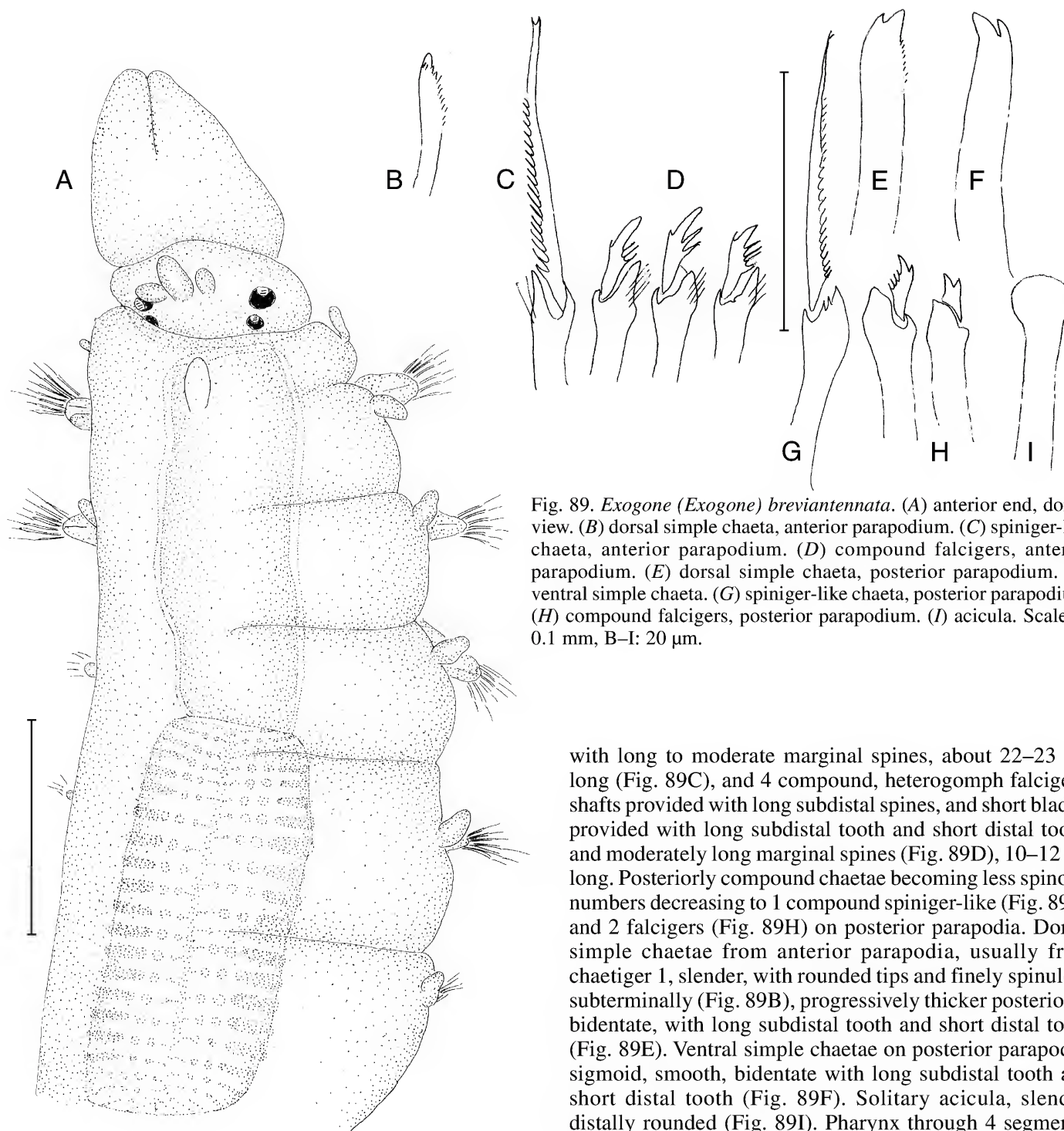


Fig. 89. *Exogone* (*Exogone*) *breviantennata*. (A) anterior end, dorsal view. (B) dorsal simple chaeta, anterior parapodium. (C) spiniger-like chaeta, anterior parapodium. (D) compound falcigers, anterior parapodium. (E) dorsal simple chaeta, posterior parapodium. (F) ventral simple chaeta. (G) spiniger-like chaeta, posterior parapodium. (H) compound falcigers, posterior parapodium. (I) acicula. Scale A: 0.1 mm, B–I: 20 μ m.

Description. Body long, slender, filiform, 3.7 mm long, 0.17 mm wide, 46 chaetigers. Prostomium ovate, wider than long; 4 eyes in trapezoidal arrangement. Antennae small, papilliform to ovate, inserted close to each other, between or slightly in front of anterior eyes, median antenna slightly longer than lateral antennae (Figs. 81E, 89A). Palps longer than prostomium, completely fused along their length, with a dorsal furrow and a distal notch, forming a triangular piece (Figs. 81E, 89A). Peristomium similar in length to following segments or slightly shorter; tentacular cirri minute, papilliform. Dorsal cirri small, similar to lateral antennae, present on all segments (Figs. 81E, 89A). Anterior and midbody parapodia each with one compound chaeta, spiniger-like, bifid blade, with hemigomph articulation, shaft provided with long, subdistal spines; blade provided

with long to moderate marginal spines, about 22–23 μ m long (Fig. 89C), and 4 compound, heterogomph falcigers, shafts provided with long subdistal spines, and short blades, provided with long subdistal tooth and short distal tooth, and moderately long marginal spines (Fig. 89D), 10–12 μ m long. Posteriorly compound chaetae becoming less spinose; numbers decreasing to 1 compound spiniger-like (Fig. 89G) and 2 falcigers (Fig. 89H) on posterior parapodia. Dorsal simple chaetae from anterior parapodia, usually from chaetiger 1, slender, with rounded tips and finely spinulose subterminally (Fig. 89B), progressively thicker posteriorly, bidentate, with long subdistal tooth and short distal tooth (Fig. 89E). Ventral simple chaetae on posterior parapodia, sigmoid, smooth, bidentate with long subdistal tooth and short distal tooth (Fig. 89F). Solitary acicula, slender, distally rounded (Fig. 89I). Pharynx through 4 segments; pharyngeal tooth on anterior rim (Fig. 89A). Proventricle short, through 2 segments, with about 17 muscle cell rows.

Remarks. Small, young specimens of *E. (E.) africana* can easily be confused with specimens of *E. (E.) breviantennata*; the latter, however, is more slender proportionally, with shorter proventricle, and the compound chaetae are more distinctly spinose. Furthermore, *E. (E.) breviantennata* is only present in tropical areas, and *E. (E.) africana* is distributed all around Australia, but appears to be less abundant in tropical waters.

Distribution. Presumably circumtropical. Australia (Queensland, Western Australia).

Habitat. Present on all kinds of substrates, from fine to coarse sand, algae, seagrasses, inside dead corals, sponges. Intertidal to about 49 m depth.

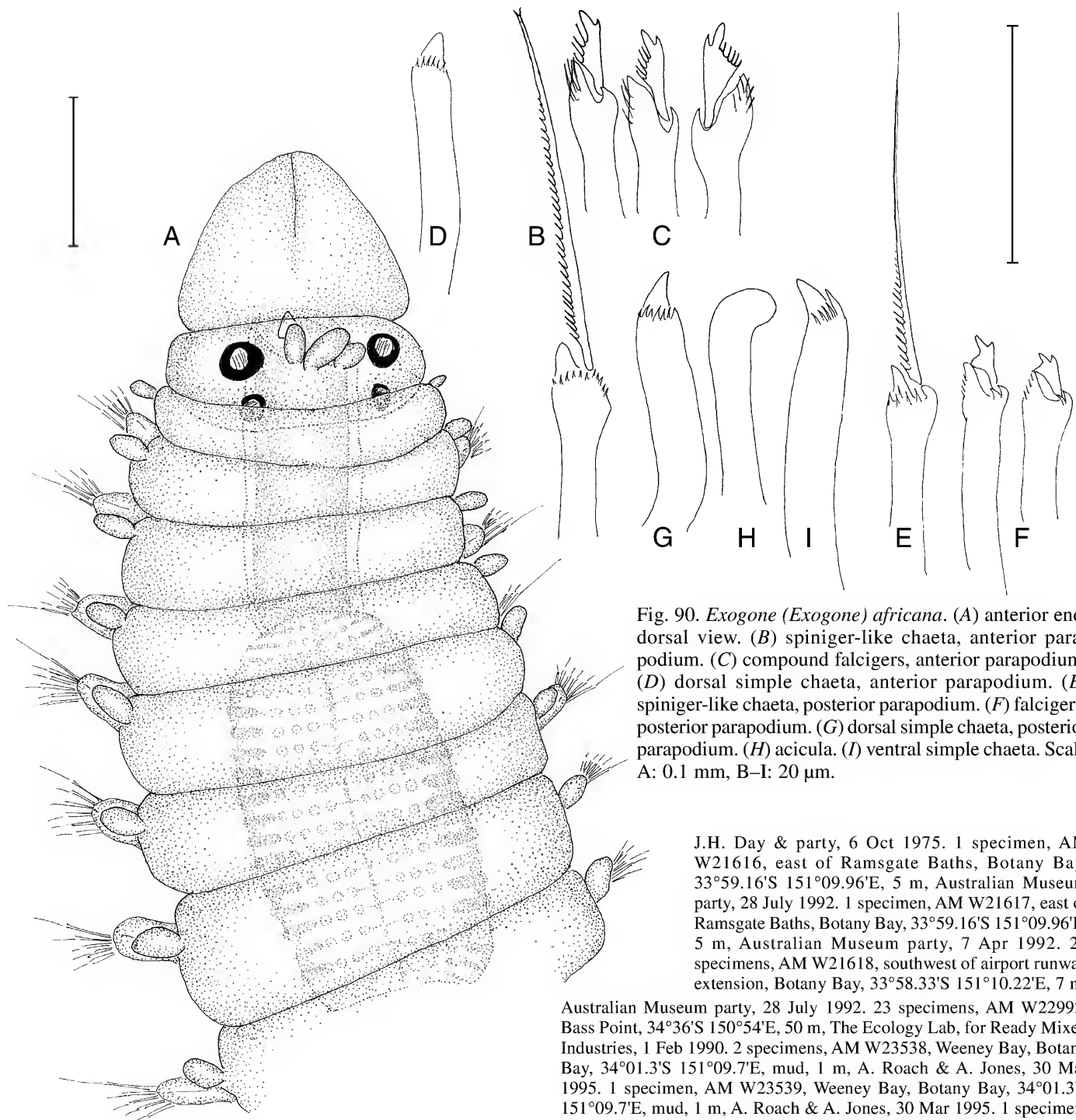


Fig. 90. *Exogone (Exogone) africana*. (A) anterior end, dorsal view. (B) spiniger-like chaeta, anterior parapodium. (C) compound falcigers, anterior parapodium. (D) dorsal simple chaeta, anterior parapodium. (E) spiniger-like chaeta, posterior parapodium. (F) falcigers, posterior parapodium. (G) dorsal simple chaeta, posterior parapodium. (H) acicula. (I) ventral simple chaeta. Scale A: 0.1 mm, B–I: 20 µm.

***Exogone (Exogone) africana*
Hartmann-Schröder, 1974**

Figs. 90A–I, 91A–E

Exogone verugera africana Hartmann-Schröder, 1974a: 137, figs. 164–168; 1979: 108, figs. 164–168 (in part); 1980a: 57; 1981: 39; 1982: 74; 1983: 136; 1984: 25; 1985: 73; 1986: 46; 1989: 32; 1990: 56; 1991: 42.

Exogone verugera Not Claparède, 1868. Haswell, 1920a: 219, pl. 17.

Material examined. AUSTRALIA: QUEENSLAND. 1 specimen, AM W26529, 600 m south of Research Point, Lizard Island, 14°40'S 145°28'E, coarse to medium sediment, 4.5 m, A.R. Jones & C. Short, 10 Oct 1978. 4 specimens, AM W26662, Triangular Island, Shoalwater Bay, 22°23'S 150°31'E, J.A. Lewis & J.R. Forsyth, 1981. NEW SOUTH WALES. 1 specimen, AM W15813, transect on south bank, Lake Merimbula, 36°53.7'S 149°54.5'E, 12.5 cm above LWS on short *Zostera* & *Halophila*;

J.H. Day & party, 6 Oct 1975. 1 specimen, AM W21616, east of Ramsgate Baths, Botany Bay, 33°59.16'S 151°09.96'E, 5 m, Australian Museum party, 28 July 1992. 1 specimen, AM W21617, east of Ramsgate Baths, Botany Bay, 33°59.16'S 151°09.96'E, 5 m, Australian Museum party, 7 Apr 1992. 23 specimens, AM W21618, southwest of airport runway extension, Botany Bay, 33°58.33'S 151°10.22'E, 7 m,

Australian Museum party, 28 July 1992. 23 specimens, AM W22992, Bass Point, 34°36'S 150°54'E, 50 m, The Ecology Lab, for Ready Mixed Industries, 1 Feb 1990. 2 specimens, AM W23538, Weeney Bay, Botany Bay, 34°01.3'S 151°09.7'E, mud, 1 m, A. Roach & A. Jones, 30 Mar 1995. 1 specimen, AM W23539, Weeney Bay, Botany Bay, 34°01.3'S 151°09.7'E, mud, 1 m, A. Roach & A. Jones, 30 Mar 1995. 1 specimen, AM W23905, Port Hacking, 34°04.23'S 151°06.38'E, sand, 18.6 m, Australian Museum Party, 27 Oct 1994. 1 specimen, AM W23907, Port Hacking, 34°04.40'S 151°06.40'E, sand, 13.2 m, Australian Museum Party, 16 Dec 1994. 1 specimen, AM W23908, Port Hacking, 34°04.04'S 151°04.04'E, sand, 15.8 m, Australian Museum Party, 1 May 1995. 1 specimen, AM W23909, Port Hacking, 34°04.00'S 151°06.35'E, sand, 15.7 m, Australian Museum Party, 10 Aug 1995. 4 specimens, AM W23910, Port Hacking, 34°04.00'S 151°06.38'E, sand, 16.9 m, Australian Museum Party, 10 Aug 1995. 7 specimens, AM W23911, Port Hacking, 34°04.13'S 151°06.37'E, sand, 14.6 m, Australian Museum Party, 12 Oct 1995. 2 specimens, AM W23921, Port Hacking, 34°04.08'S 151°06.27'E, sand, 18.7 m, Australian Museum Party, 27 Oct 1994. 1 specimen, AM W24368, east of Long Reef, 33°44.72'S 151°22.72'E, sand, 60 m, Fisheries Research Institute (NSW), 29 Apr 1991. 1 specimen, AM W24370, east of Long Reef, 33°44.72'S 151°22.72'E, sand, 60 m, Fisheries Research Institute (NSW), 29 Apr 1990. 3 specimens, AM W26422, 100 m northwest of Split Solitary Island, 30°14.0'S 153°10.8'E, mixed red algae, 15 m, S.J. Keable, 7 Mar 2000. 2 specimens, AM W26434, Manta Reef, North West Solitary Island, 30°01.5'S 153°16.5'E, lace bryozoan, 19 m, R.T. Springthorpe, 25 Jun 1992. 2 specimens, AM W26476, just south of Botany Bay, Sydney, 34°03.20'S 151°14.60'E, 79.1 m, Fisheries Research Institute (NSW), 21 Jun 1996. 3 specimens,

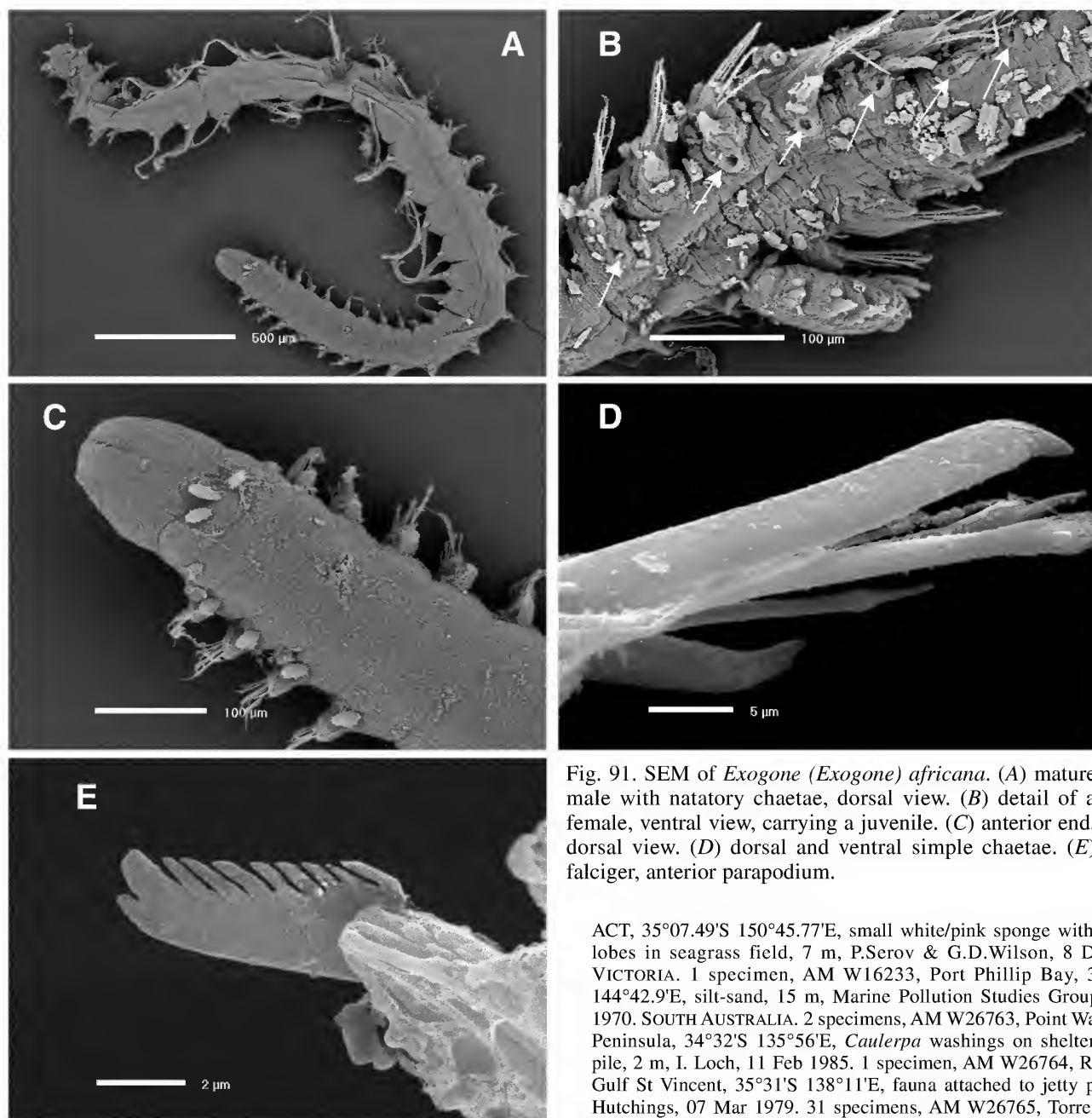


Fig. 91. SEM of *Exogone (Exogone) africana*. (A) mature male with natatory chaetae, dorsal view. (B) detail of a female, ventral view, carrying a juvenile. (C) anterior end, dorsal view. (D) dorsal and ventral simple chaetae. (E) falciger, anterior parapodium.

AM W26477, east of Malabar, Sydney, 33°58.68'S 151°17.85'E, 80.5 m, Fisheries Research Institute (NSW), 19 Dec 1995. 1 specimen, AM W26478, east of Malabar, Sydney, 33°58.60'S 151°18.00'E, 81.7 m, Fisheries Research Institute (NSW), 19 Dec 1995. 2 specimens, AM W26523, 100 m north west of Julian Rocks, Byron Bay, 28°36.8'S 153°37.8'E, shell and gravel, 15 m, E.L. Albertson *et al.*, 3 Mar 1992. 1 specimen, AM W26526, north of Honeysuckle Point, Twofold Bay, 37°5'S 149°56'E, benthic sample, 31.1 m, S. Keable, P. Albertson, 21 Feb 1985. 1 specimen, AM W26528, 100 m north west of Split Solitary Island, 30°14.0'S 153°10.8'E, gravel under rocks, 15 m, R. Gentle, Underwater Research Group, 7 Mar 1992. 1 specimen, AM W26616, Towlers Bay, Pittwater, 33°38'S 151°18'E, fine mud, 12 m, C. Rose, Dec 1992. 2 specimens, AM W26637, Bottle and Glass Rocks, Port Jackson, 33°50.9'S 151°16.2'E, airlift, 12 m, G. Clark, 11 Dec 1989. 1 specimen, AM W26639, Barrenjoey Head, Broken Bay, 33°35'S 151°20'E, algae on rocky substrate, 5 m, J.K. Lowry *et al.*, 22 Apr 1983. 1 specimen, AM W26651, Grotto Point, Port Jackson, 33°49'S 151°15'E, algae, 4 m, P. Colman, 18 July 1983. 3 specimens, AM W26663, off Bonna Point, Botany Bay, 34°0.5'S 151°11.0'E, NSW State Fisheries, 22 Jan 1975. 1 specimen, AM W195289, off Lilli Pilli Point, Port Hacking, 34°04.5'S 151°06.6'E, artificial reef, corer, NSW State Fisheries, 11 Oct 1974. 2 specimens, AM W26524, west side of Bowen Island, half way along, ACT, 35°06.91'S 150°45.91'E, grey sponge with orange flesh, large oscular chamber, 8 m, P.Serov & G.D. F. Wilson on "Sula", 7 Dec 1993. 1 specimen, AM W26527, southwest Bowen Island,

ACT, 35°07.49'S 150°45.77'E, small white/pink sponge with irregular lobes in seagrass field, 7 m, P.Serov & G.D. Wilson, 8 Dec 1993. VICTORIA. 1 specimen, AM W16233, Port Phillip Bay, 38°04.7'S 144°42.9'E, silt-sand, 15 m, Marine Pollution Studies Group, 10 Feb 1970. SOUTH AUSTRALIA. 2 specimens, AM W26763, Point Warra, Eyre Peninsula, 34°32'S 135°56'E, *Caulerpa* washings on sheltered wharf pile, 2 m, I. Loch, 11 Feb 1985. 1 specimen, AM W26764, Rapid Bay, Gulf St Vincent, 35°31'S 138°11'E, fauna attached to jetty piles, P.A. Hutchings, 07 Mar 1979. 31 specimens, AM W26765, Torrens Island, Adelaide, 34°47'S 138°32'E, sievings from mudflats in front of mangroves, P.A. Hutchings, 07 Mar 1979. 1 specimen, AM W26766, Porter Bay, Port Lincoln, 34°44'S 135°53'E, *Zostera* sievings, P.A. Hutchings, 10 Mar 1979. 1 specimen, AM W26767, Pondalowie and Marion Bays, Yorke Peninsula, 35°14'S 136°50'E, *Caulerpa* and green algae washings, 3 m, I. Loch, 22 Feb 1985. 1 specimen, AM W26768, Cape du Couedic, Kangaroo Island, 36°03'S 136°41'E, algal holdfasts on exposed reef, Hutchings & Butler, Mar 1979. 3 specimens, AM W26769, Elliston Reef, 33°39'S 134°53'E, algae from reef flat at low tide, P.A. Hutchings, 11 Mar 1979. 3 specimens, AM W26770, Elliston Reef, 33°39'S 134°53'E, algal washings, P.A. Hutchings, 11 Mar 1979. 1 specimen, AM W26771, Victor Harbour, 35°33'S 138°38'E, algal washings, P.A. Hutchings, 16 Mar 1979. WESTERN AUSTRALIA. 1 specimen, AM W4342, Cottesloe Beach, 9.5 km west of Perth, 31°59'S 115°45'E, in calcareous algae and *Idanthyrsus* worm tubes, 0.5 m, H. Paxton, 14 Feb 1970. 1 specimen, AM W26409, Fenelon Island, Kimberleys, 14°8'S 125°41'E, limestone, P.A. Hutchings, 17 July 1988. 1 specimen, AM W26807, Bush Bay, 30 km south of Carnarvon, 25°10'S 113°39'E, sand from sandflats in vicinity of seagrass beds, 0.5 m, H.E. Stoddart, 6 Jan 1984. 1 specimen, AM W26808, Wallabi Group, 28°24.00'S 113°46.16'E, shell debris in scallop beds, 35 m, P.A. Hutchings on FRV "Flinders", 30 May 1994. 1 specimen on SEM stub, AM W26818, Ningaloo Reef, Ned's Camp, Cape Range National Park, 21°59'S 113°54.5'E, brown algae in channel, 6 m, R.T. Springthorpe, 31 Dec 1983. 1 specimen, AM W26822, Bush Bay, 30 km south of Carnarvon, 25°10'S 113°39'E, sponges with epiphytic algae from shallow sandflats, 0.5 m, H.E. Stoddart, 6 Jan 1984. 1 specimen, AM W26828,

inshore reef off Ned's Camp, Cape Range National Park, 21°59'S 113°55'E, coral rubble covered with algae, 1.5 m, J.K. Lowry, 2 Jan 1984. 2 specimens, AM W26976, East Montlivet Island, Bonaparte Archipelago, 15°06'S 125°18'E, 6 m, P.A. Hutchings, 15 July 1988. 2 specimens, AM W26977, Southwest corner of Lucas Island, Brunswick Bay, 15°13'S 124°31'E, 2 m, P.A. Hutchings, 24 July 1988. 1 specimen, AM W26978, Goss Passage, Beacon Island, 28°25.5'S 113°47.0'E, dead *Acropora* plates covered in coralline algae, sponges, 24 m, P.A. Hutchings, 21 May 1994. 3 specimens, AM W26979, Southeast end of Long Island, 28°28.8'S 113°46.5'E, dead coral substrate, embedded in calcareous substrate, 30 m, P.A. Hutchings, 22 May 1994. 3 specimens, AM W26980, Goss Passage, Beacon Island, 28°25.5'S 113°47.0'E, dead coral substrate, embedded in fine sediment, 33 m, P.A. Hutchings, 23 May 1994. 6 specimens, AM W26981, north end of Long Island, Goss Passage, 28°28.3'S 113°46.3'E, dead coral covered with coralline algae & boring bivalves, 8 m, C. Bryce, 22 May 1994. 5 specimens, AM W26982, North end of Long Island, 28°27.9'S 113°46.3'E, dead coral substrate covered in coralline & brown algae, 6 m, C. Bryce, 22 May 1994. 3 specimens, AM W26983, Off jetty near Fisheries Hut, Beacon Island, 28°25.5'S 113°47.0'E, dead coral substrate, plate-like coral spp., *Acropora*, 12 m, P.A. Hutchings, 23 May 1994. 4 specimens, AM W26984, east side of West Wallabi Island, 28°27.9'S 113°40.9'E, in *Posidonia australis* root mat, plus epifauna, 2 m, P.A. Hutchings, 26 May 1994. 1 specimen, AM W26985, northeast entrance to Goss Passage, Beacon Island, 28°27.9'S 113°46.7'E, underneath isolated boulders embedded in coral sand, 33 m, P.A. Hutchings, 25 May 1994. 1 specimen, AM W26986, off south end of Long Island, Beacon Island, 28°28.8'S 113°46.3'E, dead coral substrate covered in coralline algae, 5 m, P.A. Hutchings, 25 May 1994. 1 specimen, AM W26987, Wallabi Island group, 28°23.61'S 113°43.09'E, scallop beds, sponge & shell debris, 35 m, P.A. Hutchings on FRV "Flinders", 30 May 1994. 7 specimens, AM W27431, Bush Bay, 30 km south of Carnarvon, 25°10'S 113°39'E, sand from seagrass beds on shallow sandflats, 0.5 m, H.E. Stoddart, 6 Jan 1984. 26 specimens, AM W27445, limestone reef, off Ned's camp, Cape Range National Park, 21°59'S 113°55'E, sponge with epiphytic algae, and muddy worm tubes, 1.5 m, R.T. Springthorpe, 2 Jan 1984. 29 specimens, AM W27446, Bush Bay, 30 km south of Carnarvon, 25°10'S 113°39'E, tufted balls of algae on shallow sandflats, 0.5 m, H.E. Stoddart, 6 Jan 1984. 7 specimens, AM W27447, inshore reef, Ned's Camp, Cape Range National Park, 21°59'S 113°55'E, very fine sediment and sand from patches in reef, 1 m, H.E. Stoddart, 2 Jan 1984. 6 specimens, AM W27448, Bush Bay, 30 km south of Carnarvon, 25°10'S 113°39'E, lumps of algae on shallow sandflats, 0.5 m, H.E. Stoddart, 6 Jan 1984. 41 specimens, AM W27449, inshore reef off Ned's Camp, Cape Range National Park, 21°59'S 113°59'E, frilly *Caulerpa*, 1 m, J.K. Lowry, 2 Jan 1984. 1 specimen, AM W27450, Red Bluff, Kalbarri, 27°42'S 114°09'E, mixed brown algae from rocky shore, 4 m, R.T. Springthorpe, 10 Jan 1984. 9 specimens, AM W27453, Red Bluff, Kalbarri, 27°42'S 114°09'E, mixed coralline algae from rocky shore, 4 m, J.K. Lowry, 10 Jan 1984. 1 specimen, AM W27457, reef west of groyne, 2 km south of Cape Peron, 32°16'S 115°41'E, orange sponge in deep channel of limestone reef, 4.5 m, R.T. Springthorpe, 26 Dec 1983. 2 specimens, AM W27464, outer Ningaloo Reef, off Ned's Camp, Cape Range National Park, 21°59.5'S 113°54.5'E, airlift from living *Porites*, 2 m, R.T. Springthorpe & J.K. Lowry, 1 Jan 1984. 33 specimens, AM W27465, north end of beach, Bundegi Reef, Exmouth Gulf, 21°49'S 114°11'E, rocky rubble, coralline algae with green epiphyte, 2 m, H.E. Stoddart, 4 Jan 1984. 31 specimens, AM W27466, inshore reef off Ned's Camp, Cape Range National Park, 21°59'S 113°55'E, green algae, 1.5 m, R.T. Springthorpe, 2 Jan 1984. 86 specimens, AM W27468, north end of beach, Bundegi Reef, Exmouth Gulf, 21°49'S 114°11'E, rocky rubble, brown algae with epiphytes, sediment, 2 m, H.E. Stoddart, 4 Jan 1984. 1 specimen, AM W27680, The Blow Holes, Point Quobba, 24°39'S 113°25'E, short green algae from rock platform edge, 0.5 m, J.K. Lowry *et al.*, 7 Jan 1984. 1 specimen, AM W8474, Hawaii, USA, sponge, James Lloyd, 1 Sep 1972.

Description. Body long, slender, relatively broad, 4–5 mm long, 0.25–0.3 mm wide, 33–41 segments. Prostomium oval; 4 eyes in trapezoidal arrangement (Fig. 90A). Antennae short, oval, short, inserted close to each other, similar in size but median antenna slightly longer and thicker than lateral antennae (Figs. 90A, 91A,C). Palps broad, slightly longer than prostomium, fused along their length, with a dorsal furrow. Peristomium slightly shorter than following segments; tentacular cirri small, papilliform. Dorsal cirri similar to lateral antennae or slightly longer, present on all segments (Figs. 90A, 91A,C). Anterior parapodia each with 1–2 compound chaetae with spiniger-like blade, distally bifid, with short marginal spines (Fig. 90B), about 32 µm long, also 4–5 compound chaetae with falcigerous blades, bidentate, subdistal tooth long and distal tooth short, moderate marginal spines (Figs. 90C, 91E), about 8 µm long. Posteriorly diminishing number of compound chaetae to 1 spiniger-like and 2–3 falcigers; shafts and blades of posterior compound chaetae less spinulated (Fig. 90E,F); blades of spiniger-like chaetae about 30 µm and those of falcigers about 5–6 µm long. Dorsal simple chaetae from anterior segments, with rounded tips and finely spinulose subterminally (Figs. 90D, 91D), thicker posteriorly (Fig. 90G). Ventral simple chaetae on posterior parapodia, sigmoid, thick, smooth on margin, with some short spines on base of teeth, bidentate, subdistal tooth longer and thicker than distal tooth (Figs. 90I, 91D). Acicula solitary, slender, distally rounded (Fig. 90H). Pharynx long, through 4–5 segments; pharyngeal tooth located on anterior rim (Fig. 90A). Proventricle through 4 segments, with 16–21 muscle cell rows. Pygidium with 2 long anal cirri.

Remarks. This species is similar to the European species *Exogone verugera* (Claparède, 1868), but that species lacks dorsal cirri on chaetiger 2 (San Martín, 1984a, 2003).

Distribution. Angola, Namibia, Hawaii, Japan. Australia (all states).

Habitat. Present on all intertidal and shallow substrates.

Subgenus *Sylline* Claparède, 1864

Sylline Claparède, 1864: 550.

Diagnosis. Diagnosis as *Exogone*, except compound chaetae bayonet-shaped by partial fusion of shafts and blades or blades absent; simple chaetae generally sublaterally truncated and serrated.

Type species. *Sylline brevipes* Claparède, 1864.

Key to species of *Exogone* (*Sylline*) recorded from Australia

- 1 Chaetae without blades *E. (S.) simplex*
- Chaetae with blades fused to shafts 2
- 2 On midbody, chaetae with blades long, filiform, and others with short blades *E. (S.) naidinoides*
- Blades all long, filiform *E. (S.) fustifera*

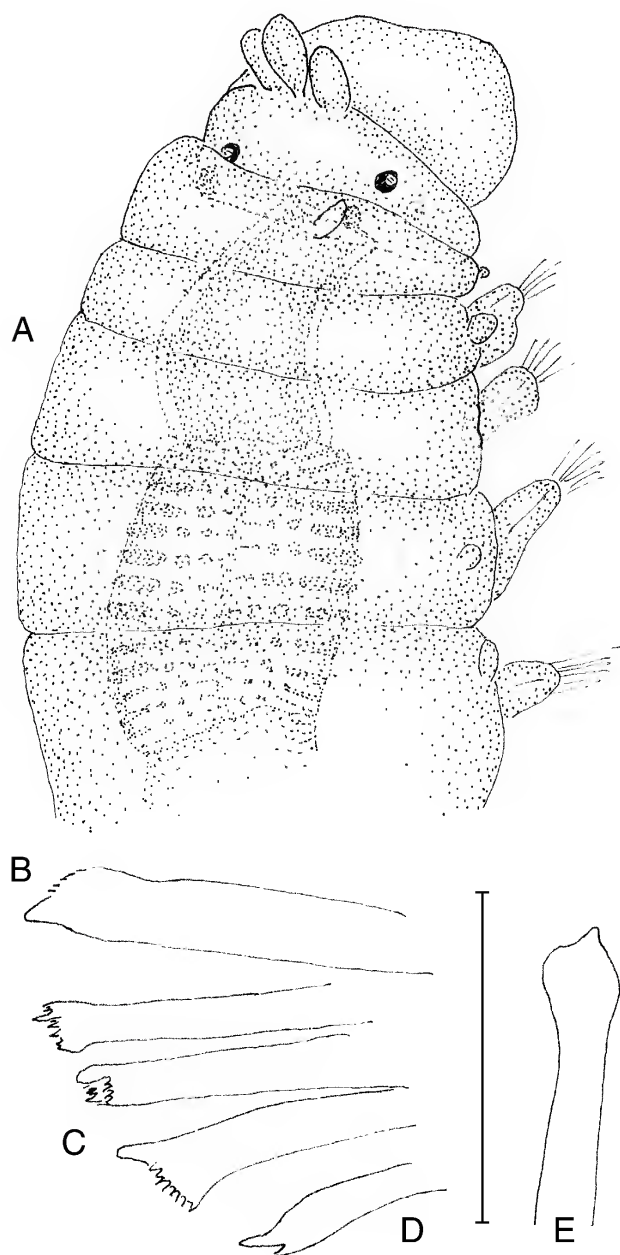


Fig. 92. *Exogone (Sylline) simplex*. (A) anterior end, dorsal view. (B) dorsal simple chaeta. (C) chaetae lacking blades. (D) ventral simple chaeta. (E) acicula. Scale A: 0.1 mm, B–E: 20 μ m.

***Exogone (Sylline) simplex*
Hartmann-Schröder, 1960**

Fig. 92A–E

Exogone simplex Hartmann-Schröder, 1960: 107, figs. 134–136; 1979: 109, figs. 169–170; 1980a: 56; 1981: 38; 1990: 55.

Material examined. WESTERN AUSTRALIA. 1 specimen, Broome, ZHM, P-16703, intertidal sand, G. Hartmann-Schröder, 23 Sept 1975.

Description. Body small, filiform, up to 2.3 mm long, 0.4 mm wide, 21 chaetigers. Prostomium oval; 4 small eyes in trapezoidal arrangement. Antennae small, originating close to each other near middle of anterior margin of prostomium (Fig. 92A); lateral antennae papilliform, median antenna slightly longer than lateral antennae (Fig. 92A). Palps, broad, fused along their length (Fig. 92A). Peristomium similar in length to following segments, covering posterior part of prostomium; tentacular cirri minute, smaller than

lateral antennae. Dorsal cirri ovoid, shorter than parapodial lobes, absent on chaetiger 2 (Fig. 92A). Parapodia each with 3 chaetae lacking blades, distally spinose (Fig. 92C). Dorsal simple chaetae from anterior parapodia, smooth, unidentate (Fig. 92B). Ventral simple chaetae sigmoid, bidentate, with distal tooth shorter than distal tooth, smooth (Fig. 92D). Acicula solitary, slender, distally rounded, provided with a short tip (Fig. 92E). Pharynx short and relatively wide, through 3 segments (Fig. 92A); pharyngeal tooth on anterior margin (Fig. 92A). Proventricle short, through 2 segments, with 12–16 muscle cell rows. Pygidium with 2 long anal cirri.

Distribution. Red Sea. Australia (Western Australia, New South Wales).

Habitat. On algae, fine sand. Intertidal and shallow water.

***Exogone (Sylline) naidinoides* Westheide, 1974**

Figs. 93A–G, 94A–D

Exogone naidinoides Westheide, 1974: 301, figs. 50, 51 e–f; Russell, 1991: 57, fig. 3.

Exogone (Sylline) naidinoides.—San Martín, 1991a: 737, figs. 11 a–f; Ruíz-Ramírez & Salazar-Vallejo, 2001: 128, fig. 4 (66–76).

Material examined. AUSTRALIA: WESTERN AUSTRALIA. 3 specimens, AM W27429, inshore reef, Ned's Camp, Cape Range National Park, 21°59'S 113°55'E, very fine sediment and sand from patches in reef, 1 m, H.E. Stoddart, 2 Jan 1984. 26 specimens, AM W27434, limestone reef, off Ned's camp, Cape Range National Park, 21°59'S 113°55'E, sponge with epiphytic algae, and muddy worm tubes, 1.5 m, R.T. Springthorpe, 2 Jan 1984. 6 specimens (2 specimens on SEM stub), AM W27436, north end of beach, Bundege Reef, Exmouth Gulf, 21°49'S 114°11'E, rocky rubble, brown algae with epiphytes, sediment, 2 m, H.E. Stoddart, 4 Jan 1984. 5 specimens (2 specimens on SEM stub), AM W27438, north end of beach, Bundege Reef, Exmouth Gulf, 21°49'S 114°11'E, rocky rubble, coralline algae with green epiphyte, 2 m, H.E. Stoddart, 4 Jan 1984. 4 specimens (1 specimens on SEM stub), AM W27440, Bush Bay, 30 km south of Carnarvon, 25°10'S 113°39'E, tufted balls of algae on shallow sandflats, 0.5 m, H.E. Stoddart, 6 Jan 1984. 5 specimens, AM W27444, inshore reef off Ned's Camp, Cape Range National Park, 21°59'S 113°59'E, frilly *Caulerpa*, 1 m, J.K. Lowry, 2 Jan 1984. 12 specimens, AM W27467, inshore reef off Ned's Camp, Cape Range National Park, 21°59'S 113°55'E, green algae, 1.5 m, R.T. Springthorpe, 2 Jan 1984. 1 specimen, AM W27679, Bush Bay, 30 km south of Carnarvon, 25°10'S 113°39'E, sand from seagrass beds on shallow sandflats, 0.5 m, H.E. Stoddart, 6 Jan 1984.

Description. Body small, a female carrying juveniles ventrally is 1.5 mm long, 0.08 mm wide, 23 chaetigers. Prostomium ovate, wider than long; 4 eyes in trapezoidal arrangement. Antennae inserted in line anteriorly to anterior eyes; lateral antennae ovate, shorter than prostomium; median antenna longer than lateral antennae, longer than prostomium but shorter than prostomium and palps together (Figs. 93A, 94A). Palps broad, short, similar in length to prostomium, fused along their length, with dorsal groove and small distal notch (Figs. 93A, 94B). Peristomium shorter than following segments, usually covering dorsal posterior part of prostomium; tentacular cirri minute, papilliform. Dorsal cirri ovoid, larger than tentacular cirri, absent on chaetiger 2 (Figs. 93A, 94A). Parapodia of anterior 3 chaetigers each with 3–4 chaetae with blades fused to shafts, reduced to a thick spine, with a crown of shorter spines surrounding tip of shafts (Fig. 93B). Parapodia from chaetiger 4 each with 1 chaeta with a slender, filiform blade, partially fused with shaft, tip of shaft spinose (Fig. 93D),

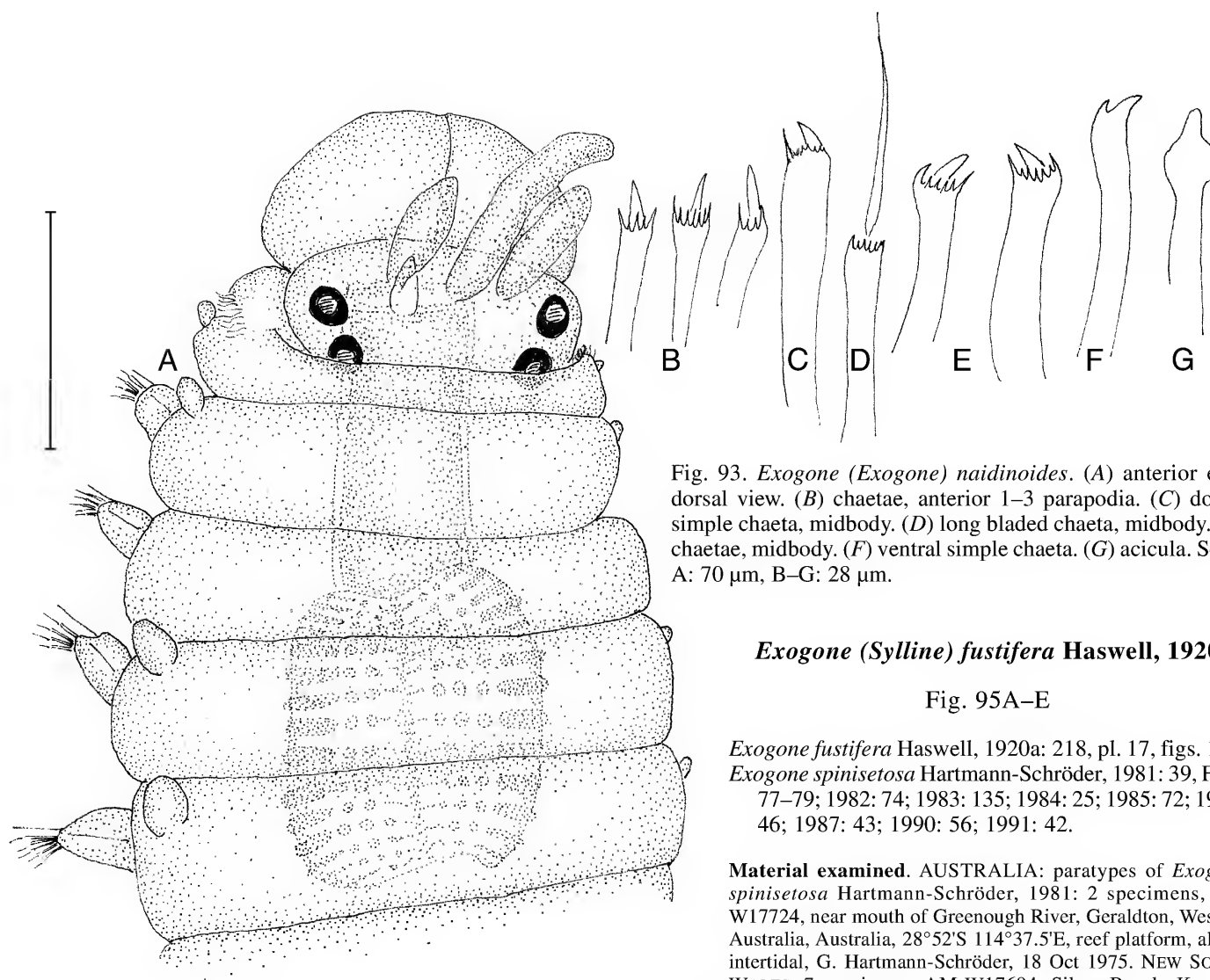


Fig. 93. *Exogone (Exogone) naidinoides*. (A) anterior end, dorsal view. (B) chaetae, anterior 1–3 parapodia. (C) dorsal simple chaeta, midbody. (D) long bladed chaeta, midbody. (E) chaetae, midbody. (F) ventral simple chaeta. (G) acicula. Scale A: 70 μ m, B–G: 28 μ m.

Exogone (Sylline) fustifera Haswell, 1920

Fig. 95A–E

Exogone fustifera Haswell, 1920a: 218, pl. 17, figs. 1–6. *Exogone spinisetosa* Hartmann-Schröder, 1981: 39, Figs. 77–79; 1982: 74; 1983: 135; 1984: 25; 1985: 72; 1986: 46; 1987: 43; 1990: 56; 1991: 42.

Material examined. AUSTRALIA: paratypes of *Exogone spinisetosa* Hartmann-Schröder, 1981: 2 specimens, AM W17724, near mouth of Greenough River, Geraldton, Western Australia, Australia, 28°52'S 114°37.5'E, reef platform, algae, intertidal, G. Hartmann-Schröder, 18 Oct 1975. NEW SOUTH WALES. 7 specimens, AM W17694, Silver Beach, Kurnell,

and 2 chaetae with shafts distally spinose; blades fused to shafts, reduced to a thick, short spine (Fig. 93E); only 1 of these chaetae on posterior parapodia. Dorsal simple chaetae from chaetiger 1, distally spinose, ending in acute tip, with a subdistal tooth, provided with a long, distinct inferior spine (Fig. 93C), becoming thicker posteriorly. Ventral simple chaetae from midbody, sigmoid, smooth, bidentate, subdistal tooth longer than distal tooth (Fig. 93F). Acicula solitary, proportionally thick, with a subdistal enlargement (Fig. 93G). Pharynx through 3–4 segments; pharyngeal tooth located on anterior rim (Fig. 93A). Proventricle short, through 2 segments, with about 17 muscle cell rows. Pygidium semi-circular, with 2 long anal cirri.

Remarks. *Exogone (Sylline) aquadulcensis* Pascual, *et al.* (1996), from Canary Islands, is similar, but that species has shorter proventricle, the median antenna is proportionally shorter, the dorsal simple chaetae lack the subdistal spine, and the ventral simple chaetae are unidentate (Pascual *et al.*, 1996).

Distribution. Galápagos Islands, Caribbean Sea (Cuba, Belize). Australia (Western Australia).

Habitat. Interstitial in sand and fine sediments, on mangrove roots, dead corals, amongst algae, on shallow water.

34°00.5'S 151°12'E, intertidal, 0 m, Rosalie Watkins, MSB, 18 Oct 1979. 5 specimens, AM W18851, off Bonna Point, Botany Bay, 34°00.5'S 151°11.0'E, NSW State Fisheries, 22 Jan 1975. 1 specimen, AM W20470, Hare Bay, Jervis Bay, 34°59.7'S 150°45.0'E, *Posidonia*, 3 m, P.A. Hutchings & party, Nov 1989. 1 specimen, AM W21619, 800 m off Port Botany, Botany Bay, 33°58.75'S 151°11.03'E, 7 m, Australian Museum party, 07 Apr 1992. 1 specimen, AM W21620, south of airport runway extension, Botany Bay, 33°58.13'S 151°11.16'E, 5 m, Australian Museum party, 7 Apr 1992. 1 specimen, AM W22984, east of Providential Head, Wattamolla, 34°08'S 151°08.5'E, 50 m, The Ecology Lab, 1 Feb 1990. 1 specimen, AM W23542, Weeney Bay, Botany Bay, 34°01.3'S 151°09.7'E, mud, 1 m, A. Roach & A. Jones, 30 Mar 1995. 1 specimen, AM W23912, Botany Bay, 33°58.78'S 151°11.84'E, sand, 18.4 m, AM party, 31 May 1994. 1 specimen, AM W26390, South Ledge, Cook Island, 28°11.65'S 153°34.63'E, yellow green sponge and crinoid, 12 m, A.R. Parker, 9 Jun 1993. 1 specimen, AM W26391, 100 m north west of Split Solitary Island, 30°14.0'S 153°10.8'E, brown algae, 17 m, S.J. Keable, 7 Mar 1992. 1 specimen, AM W26392, 400 yards south of southern entrance to Jervis Bay, 35°07'S 150°46'E, 6.1 m, P.A. Hutchings, 20 July 1972. 1 specimen, AM W26394, Summer Cloud Bay, Wreck Bay, 35°10.5'S 150°41'E, large boulders, little algal cover, underside of rocks, 3 m, P.A. Hutchings, 26 Nov 1971. 1 specimen, AM W26412, North Ledge, Cook Island, 28°11.44'S 153°34.67'E, sponge, 10 m, A.R. Parker, 08 Jun 1993. 1 specimen, AM W26414, North Creek Canal, Richmond River, 28°52.1'S 153°32.8'E, mud, 3 m, P.B. Berents *et al.*, 2 Mar 1992. 6 specimens, AM W26415, 100 m north west of Split Solitary Island, 30°14.0'S 153°10.8'E, gravel under rocks, 15 m, R. Gentle, 7 Mar 1992. 1 specimen, AM W26428, 150 m east of Burrill Rocks, 35°23.41'S 150°28.18'E, dead bryozoan encrusted with algae, bryozoa and hydroids, 17 m, K. Attwood, 1 May 1997. 2 specimens, AM W26429, 100 m north west of Split Solitary Island, 30°14.0'S 153°10.8'E, mixed red algae, 15 m, S.J. Keable, 7 Mar 1992. 4 specimens, AM W26433, 100 m northwest of Split Solitary Island, 30°14.0'S 153°10.8'E, encrusting algae and ascidians, 15 m, E.L. Albertson, 7 May 1992. 1 specimen, AM W26467,

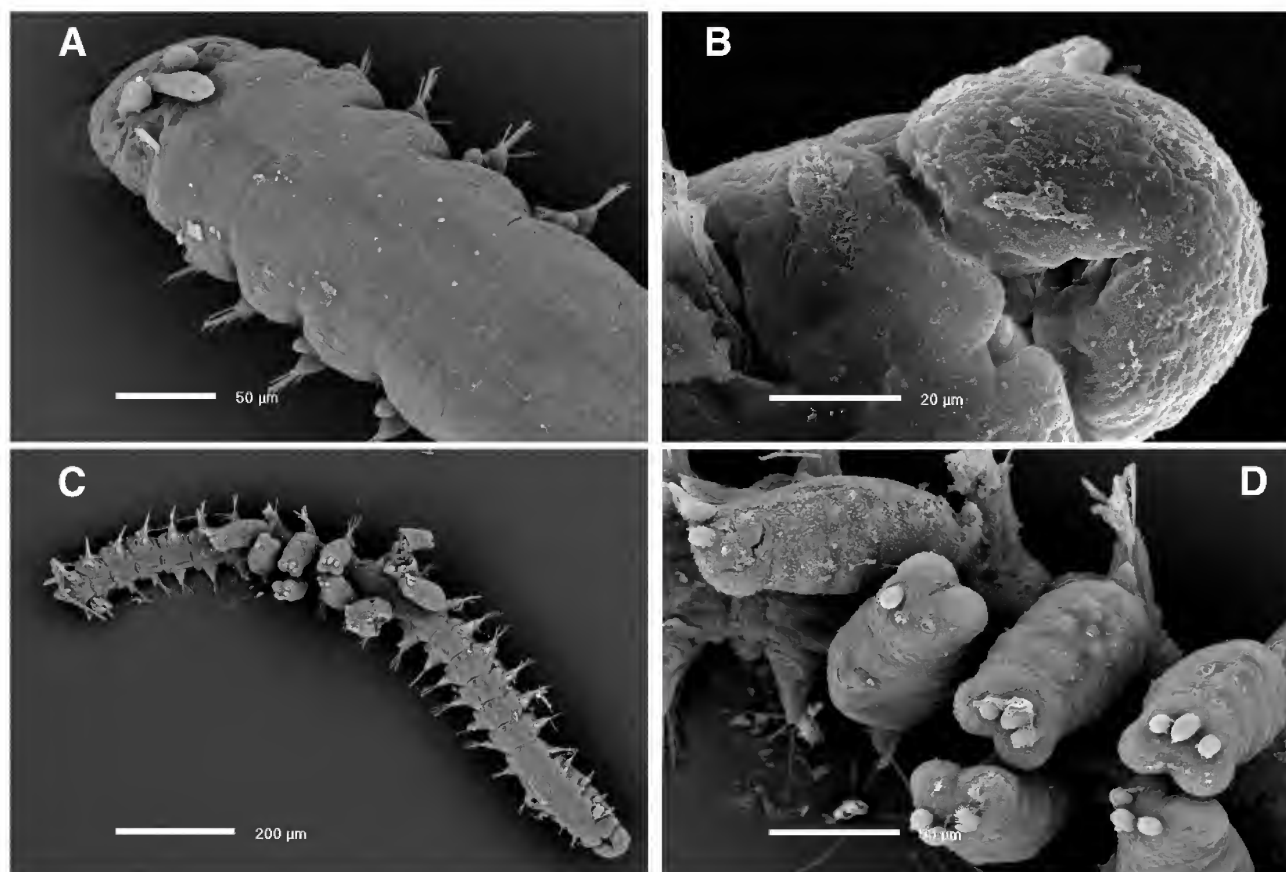


Fig. 94. SEM of *Exogone (Exogone) naidinoides*. (A) anterior end, dorsal view. (B) anterior end, ventral view. (C) mature female carrying juveniles, ventral view. (D) detail of the juveniles.

500 m west of northern-most part of Port Botany, Botany Bay, 33°58.28'S 151°11.98'E, 7 m, AM party, 27 July 1992. 2 specimens, AM W26534, northern side of Bannister Head, 35°19.15'S 150°29.12'E, grey sponge from top of boulder, 18 m, K. Attwood *et al.*, 1 May 1997. 3 specimens, AM W26535, 100 m north west of Split Solitary Island, 30°14.0'S 153°10.8'E, mixed red algae, 15 m, S.J. Keable, 7 Mar 1992. 6 specimens, AM W26541, 150 m east of Burrill Rocks, 35°23.41'S 150°28.18'E, surface of sponges, 19 m, K. Attwood *et al.*, 1 May 1997. 3 specimens, AM W26542, southwest side of South Solitary Island, 30°12.0'S 153°16.0'E, coral rubble, 18 m, R.T. Springthorpe, 24 Jun 1992. 1 specimen, AM W26548, Burrill Rocks, Ulladulla, 35°23.39'S 150°28.24'E, gorgonacean, 24 m, R.T. Springthorpe, 7 Mar 1997. 125 specimens, AM W26634, Barrenjoey Head, Broken Bay, 33°35'S 151°20'E, algae on rocky substrate, 5 m, J.K. Lowry *et al.*, 22 Apr 1983. 9 specimens, AM W26635, north east corner of Clark Island, 33°51.85'S 151°14.47'E, *Ecklonia* holdfast, 5 m, P.A. Hutchings, 17 Apr 1996. 22 specimens, AM W26640, Crowdy Head, 31°50'S 152°45'E, brown algae in rock pools, J.K. Lowry, 13 Jan 1982. 27 specimens, AM W26648, Grotto Point, Port Jackson, 33°49'S 151°15'E, algae, 4 m, P. Colman, 18 July 2000. 1 specimen, AM W26657, north east corner of Clark Island, 33°51.85'S 151°14.47'E, *Sargassum* sp., 2 m, I. Takeuchi & D. Bray, 17 Apr 1996. 1 specimen, AM W26393, southwest Bowen Island, ACT, 35°07.49'S 150°45.77'E, rock on sandy bottom with bryozoans and encrusting polychaetes, 8 m, P.Serov & G.D.F. Wilson, 8 Dec 1993. 1 specimen, AM W26395, Murrays Beach, Jervis Bay, ACT, 35°07.5'S 150°45.5'E, 9 m, P.A. Hutchings, 23 Jan 1973. 1 specimen, AM W26396, west side of Bowen Island, half way along, ACT, 35°06.91'S 150°45.91'E, light-grey sponge, 6 m, P.Serov & G.D.F. Wilson, 7 Dec 1993. 1 specimen, AM W26397, west side of Bowen Island, half way along, ACT, 35°06.91'S 150°45.91'E, grey sponge with orange flesh, large oscular chamber, 8 m, P.Serov & G.D.F. Wilson on "Sula", 7 Dec 1993. VICTORIA. 1 specimen, MV F87424, Geelong Arm, Port Phillip Bay, 38°09.3'S 144°42.7'E, sand and seagrass, 3 m depth, 11 Jun 1971. 8 specimens, MV F62033, Eastern Bass Strait, 11.7 km W of Pt. Ricardo, coarse sand, 5 m depth, 4 Jun 1991. TASMANIA. 1 specimen, AM W18197, Fancy Point, Bruny Island, 43°16'S 147°19'E, in algae, 3–6 m, G. Edgar, 10 Nov 1980. 2 specimens, AM W18196, Fancy Point, Bruny Island, 43°16'S 147°19'E, in algae, 3–6 m, G. Edgar, 05 Mar 1979. SOUTH AUSTRALIA. 1 specimen, AM W26751, Elliston Reef, 33°39'S 134°53'E, algae from reef flat at low tide, P.A. Hutchings, 11 Mar 1979. 1 specimen,

AM W26752, Victor Harbour, 35°33'S 138°38'E, algae, P.A. Hutchings, 16 Mar 1979. 1 specimen, AM W26753, Victor Harbour, 35°33'S 138°38'E, *Zostera* washings, P.A. Hutchings, 16 Mar 1979. 3 specimens, AM W26756, Elliston Reef, 33°39'S 134°53'E, algae from reef flat at low tide, P.A. Hutchings, 11 Mar 1979. WESTERN AUSTRALIA. 1 specimen, AM W26413, off end of South Mole, Arthur Head, Fremantle, 32°03'S 115°44'E, orange tunicates, 6 m, J.K. Lowry, 25 Dec 1983. 4 specimens, AM W26801, Red Bluff, Kalbarri, 27°42'S 114°09'E, rocky shore, dictyotalean from cave, 4 m, J.K. Lowry, 10 Jan 1984. 1 specimen, AM W26824, Red Bluff, Kalbarri, 27°42'S 114°09'E, mixed brown algae from rocky shore, 4 m, R.T. Springthorpe, 10 Jan 1984. 1 specimen, AM W26827, Red Bluff, Kalbarri, 27°42'S 114°09'E, round-leaved seagrass in shallow sand on rock, 4 m, R.T. Springthorpe, 10 Jan 1984. 1 specimen, AM W26836, west of Penguin Island, Warnbro Sound, 32°20'S 115°43'E, dead reef sponges, 5 m, P.A. Hutchings, 21 Mar 1993. 2 specimens, AM W27025, Goss Passage, Beacon Island, 28°25.5'S 113°47.0'E, dead branching coral substrate covered in coralline algae, 10 m, P.A. Hutchings, 18 May 1994. 1 specimen, AM W27026, Goss Passage, Beacon Island, 28°25.5'S 113°47.0'E, dead *Acropora* with sponges, ascidians, coralline algae, 32 m, P.A. Hutchings, 19 May 1994. 4 specimens, AM W27027, Goss Passage, Beacon Island, 28°25.5'S 113°47.0'E, dead *Acropora* plates covered in coralline algae, 8 m, P.A. Hutchings, 19 May 1994. 10 specimens, AM W27029, Goss Passage, Beacon Island, 28°25.5'S 113°47.0'E, dead *Acropora* plates covered in coralline algae, 20 m, P.A. Hutchings, 20 May 1994. 15 specimens, AM W27030, Goss Passage, Beacon Island, 28°25.5'S 113°47.0'E, dead coral plates covered in coralline algae, 20 m, P.A. Hutchings, 22 May 1994. 2 specimens, AM W27031, north end of Long Island, Goss Passage, 28°28.3'S 113°46.3'E, dead coral covered with coralline algae & boring bivalves, 8 m, C. Bryce, 22 May 1994. 6 specimens, AM W27032, north end of Long Island, 28°27.9'S 113°46.3'E, dead coral substrate with coralline & brown algae, 6 m, C. Bryce, 22 May 1994. 1 specimen, AM W27033, southeast end of Long Island, 28°28.8'S 113°46.5'E, dead coral substrate with coralline algae, 8 m, P.A. Hutchings, 22 May 1994. 1 specimen, AM W27034, Goss Passage, Beacon Island, 28°25.5'S 113°47.0'E, dead coral substrate embedded in fine sediment, 33 m, P.A. Hutchings, 23 May 1994. 2 specimens, AM W27035, off jetty near Fisheries Hut, Beacon Island,

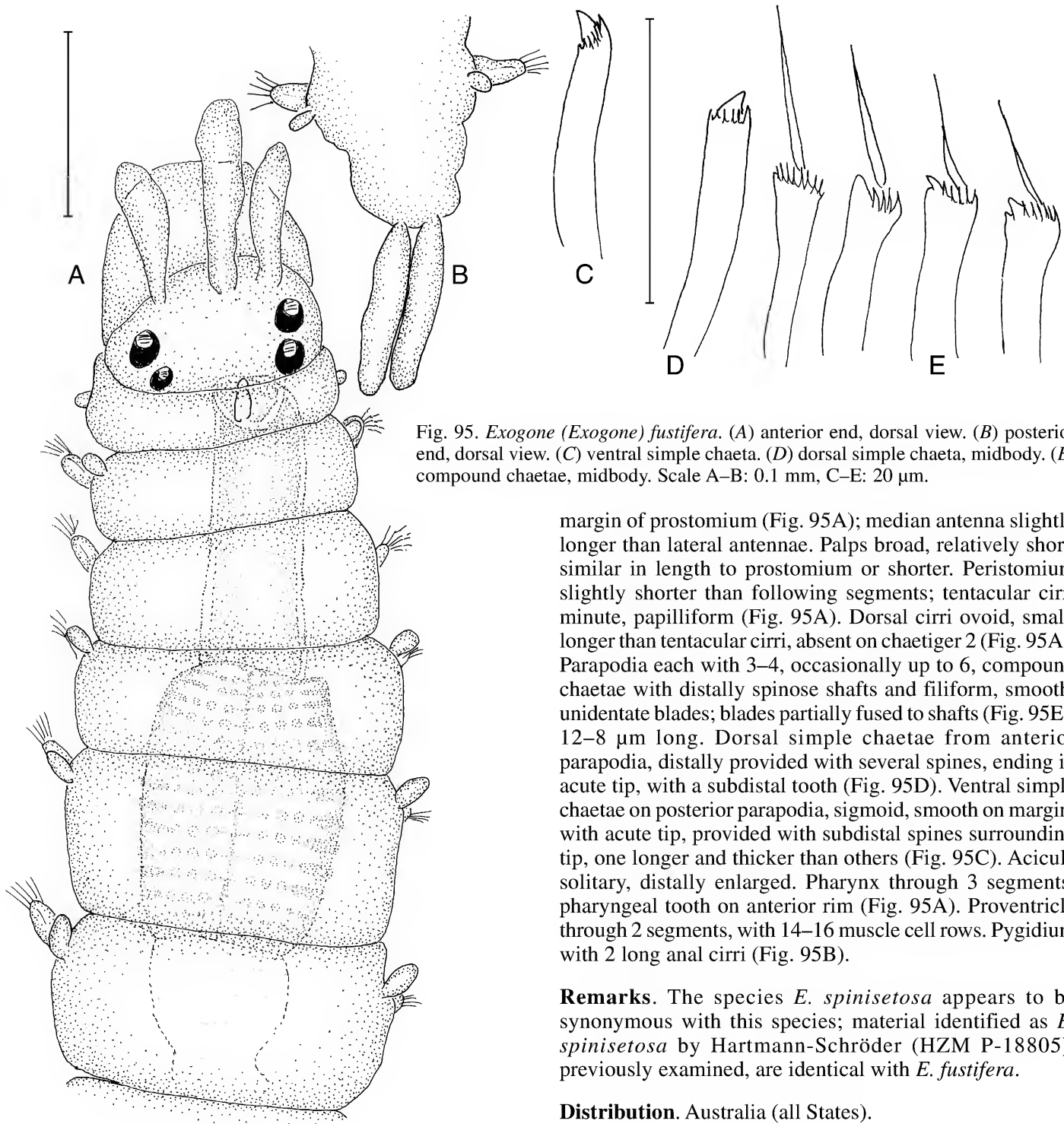


Fig. 95. *Exogone (Exogone) fustifera*. (A) anterior end, dorsal view. (B) posterior end, dorsal view. (C) ventral simple chaeta. (D) dorsal simple chaeta, midbody. (E) compound chaetae, midbody. Scale A–B: 0.1 mm, C–E: 20 µm.

margin of prostomium (Fig. 95A); median antenna slightly longer than lateral antennae. Palps broad, relatively short, similar in length to prostomium or shorter. Peristomium slightly shorter than following segments; tentacular cirri minute, papilliform (Fig. 95A). Dorsal cirri ovoid, small, longer than tentacular cirri, absent on chaetiger 2 (Fig. 95A). Parapodia each with 3–4, occasionally up to 6, compound chaetae with distally spinose shafts and filiform, smooth, unidentate blades; blades partially fused to shafts (Fig. 95E), 12–8 µm long. Dorsal simple chaetae from anterior parapodia, distally provided with several spines, ending in acute tip, with a subdistal tooth (Fig. 95D). Ventral simple chaetae on posterior parapodia, sigmoid, smooth on margin, with acute tip, provided with subdistal spines surrounding tip, one longer and thicker than others (Fig. 95C). Acicula solitary, distally enlarged. Pharynx through 3 segments; pharyngeal tooth on anterior rim (Fig. 95A). Proventricle through 2 segments, with 14–16 muscle cell rows. Pygidium with 2 long anal cirri (Fig. 95B).

Remarks. The species *E. spinisetosa* appears to be synonymous with this species; material identified as *E. spinisetosa* by Hartmann-Schröder (HZM P-18805), previously examined, are identical with *E. fustifera*.

Distribution. Australia (all States).

Habitat. Present on all substrates on intertidal and shallow waters.

28°25.5'S 113°47.0'E, dead plate coral substrate—*Acropora*, *Montipora* spp., 12 m, P.A. Hutchings, 23 May 1994. 4 specimens, AM W27036, east side of West Wallabi Island, 28°27.9'S 113°40.9'E, in *Posidonia australis* root mat with epifauna, 2 m, P.A. Hutchings, 26 May 1994. 1 specimen, AM W27037, northeast entrance to Goss Passage, Beacon Island, 28°27.8'S 113°46.7'E, dead branching *Acropora* substrate covered with algae, 24 m, P.A. Hutchings, 25 May 1994. 9 specimens, AM W27038, northeast entrance to Goss Passage, Beacon Island, 28°27.9'S 113°46.7'E, dead plate-like *Acropora* covered with coralline algae, 8 m, P.A. Hutchings, 25 May 1994. 8 specimens, AM W27039, off south end of Long Island, Beacon Island, 28°28.8'S 113°46.3'E, dead coral substrate covered in coralline algae, 5 m, P.A. Hutchings, 25 May 1994.

Description. Body long, slender, filiform, 7 mm long, 0.11–0.12 mm wide, 43 chaetigers. Prostomium ovate to semi-circular; 4 eyes in trapezoidal arrangement. Antennae longer than palps and longer than prostomium but shorter than prostomium and palps together, cylindrical to claviform, slightly enlarged distally, inserted separately near anterior

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subfamily Exogoninae, and, together with Keyne Monro, managed the collection. Previous work extracting syllids was mostly done by volunteers. Richard Johnson helped me with the literature. Dr Pat Hutchings and Anna Murray helped me with the editing of the manuscript and offered valuable suggestions. All of them also gave me their generosity and friendship. The comments and suggestions of two anonymous referees, as well as the efforts of the editor, greatly improved the quality of the paper. Also, thanks to the Museum of Victoria, especially Ms Melanie McKenzie and Mr Chris Rowe, for the loan of some specimens and their assistance. Ms Miranda Lowe, British Museum Natural History, London (UK), Dr Angelika Brandt and Gisella Wegener, Hamburgische Zoologische Museum, Hamburg (Germany), Professor Nathan W. Riser, Nahant University (USA), and Professor Wilfried Westheide, University of Osnabrück (Germany) kindly loaned specimens for comparison. I want to express also my gratitude to Miss Ingrid Skirka and Mr Etienne Fourie, who contributed greatly to a pleasant stay in Sydney. Dr Esperanza Salvador and Miss Laura Tormo (SIDI of the UAM) assisted me with the SEM study and photographs, and Mr Francisco Simón Madero helped me in the preparation of the plates.

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